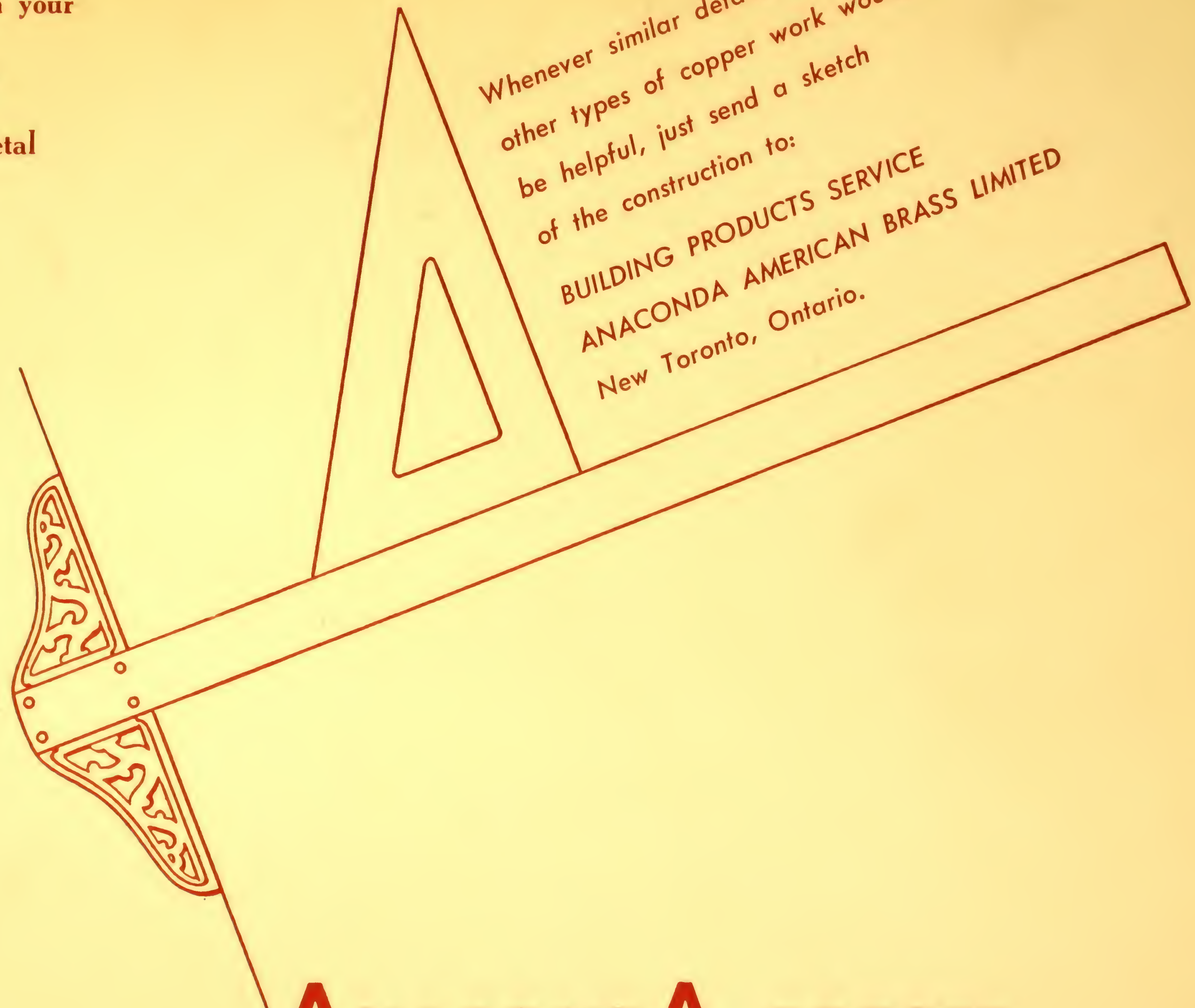
COPPER SHEET METAL WORK

R.A.I.C. - A.I.A. FILE No. 12

Oct. 1953 -

We suggest that you keep this folder in your permanent architectural file. Additional drawings will be issued periodically covering other sheet metal work frequently encountered in residential and commercial construction.



ANACONDA COPPER

for lasting sheet metal construction

ANACONDA AMERICAN BRASS LIMITED

MAIN OFFICE AND PLANT — NEW TORONTO, ONTARIO

Publications Describing Anaconda Building Products

PUBLICATION NUMBER	
B-1	Brass Pipe and Copper Tubes
C-2	Copper Tubes for Heating Lines
C-3SA	Sheet Copper for Building Construction
C-4	Copper Tubes for Radiant Panel Heating
C-7	Anaconda Economy Copper Roofing
C-7-1	Economy Copper Roofing
C-9	What Most People Want to Know About Radiant Panel Heating
C-10	Copper Tubes for Water Wells
C-11	Copper Tubes and Fittings for Rural Water Systems
C-28	Through-Wall Flashing
E-12	Everdur Conduit
DM-4848	Flat Lock Soldered Seam Copper Roofing

ANACONDA AMERICAN BRASS LIMITED — NEW TORONTO, ONT.

FLASHING—CONSTRUCTION & EXPANSION JOINT A.I.A. 12

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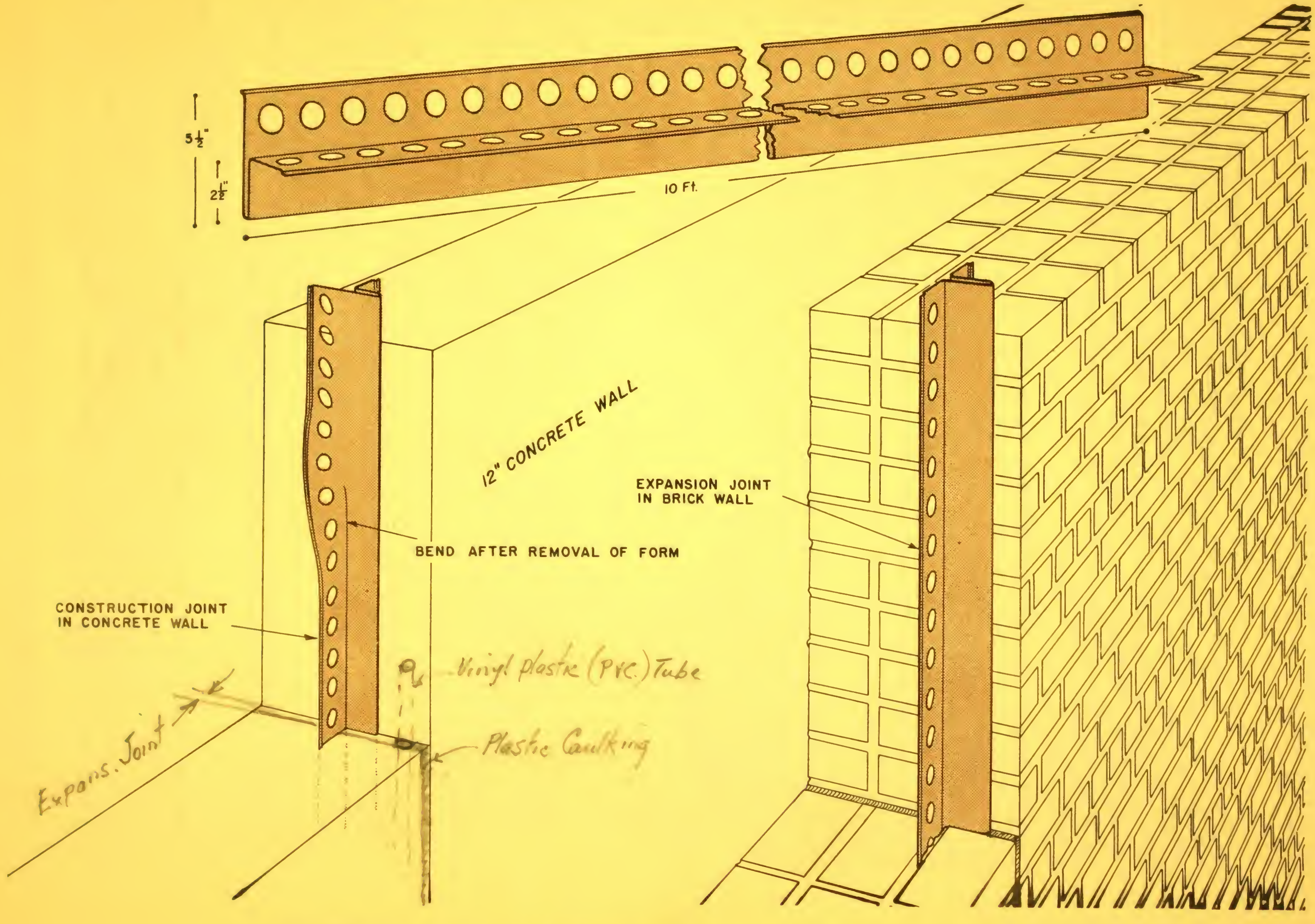


FLASHING - CONSTRUCTION JOINTS AND EXPANSION JOINTS

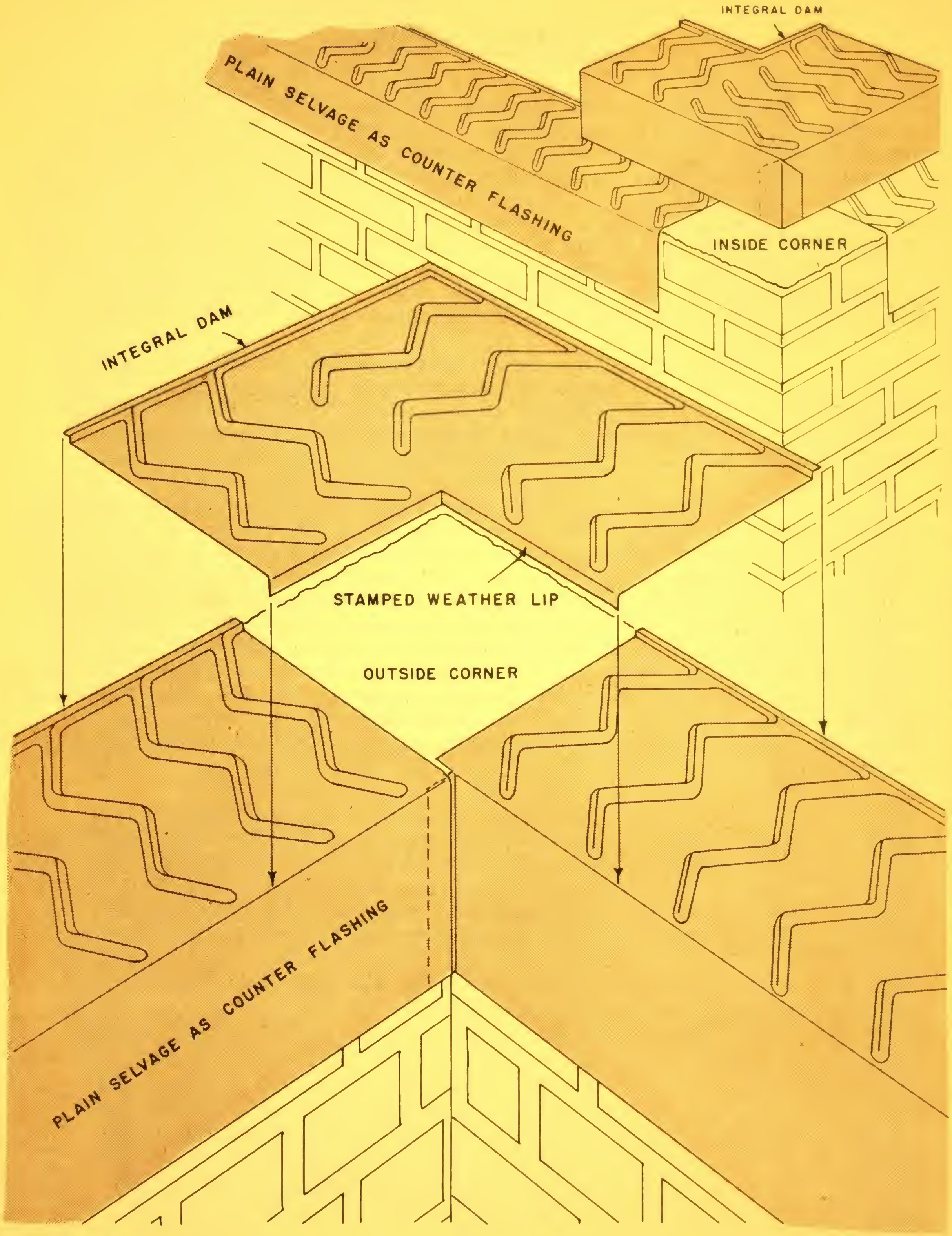
Whether it be a construction joint in concrete, or an expansion joint in the brickwork of building walls, or in masonry abutments, buttresses and retaining walls, the joint must be wind-tight and waterproof. This can best be accomplished through the use of copper flashing strips formed in a manner that will permit movement due to expansion and contraction without breaking the seal.

In pouring concrete the vertical finish line of a day's pour is bound to produce a crack or seam due to shrinkage and the lack of cohesion between new and old concrete which will admit water, and particularly ground water that may be under hydrostatic pressure. Horizontal construction joints also have a seam or cleavage line, but this is less likely to be troublesome because the seam is generally quite tight due to pressure from the weight of the concrete. All vertical construction joints in concrete should be flashed with copper as shown on the drawing.

In order to avoid cracks in long walls of brick masonry, expansion joints are provided at intervals of 200', or as little as 20', depending upon the design of building, the height of the building wall, and whether or not the top of the wall is exposed on both sides. Expansion and contraction in masonry walls are effected somewhat by the surroundings and bearings in relation to the points of the compass. The movement is least at the ground where the masonry gets the cooling effect of the more or less uniform temperature of the earth. The temperature of the wall increases as it rises away from the influence of the cool earth to a point usually several stories above ground where expansion and contraction are governed entirely by climate, season, and conditions of the weather. Copper expansion joints and flashings built into the walls as shown on the drawing are the accepted method of making vertical joints safe from the penetration of water and minimizes the danger of damaging action by frost. For good appearance and to permit a certain amount of movement without being noticeable the exposed joints on the outer and inner face of the wall are filled with an elastic caulking compound.

Copper for construction - expansion joints can be either of roofing temper or cornice temper, although the latter is preferred because of additional stiffness, straightness and ease of handling. The expansion loop is about 2-1/2" deep, as shown on the drawing, and the flanges with perforations built into the masonry 3" on each side of the joint. These strips are generally furnished in 10' lengths, and are joined endwise by telescoping the pieces, one over the other and making the joint water-tight with solder, if so desired.

ANACONDA THROUGH-WALL FLASHING



FLASHING, ONE PIECE CORNER

A.I.A. 12

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

CORNER FLASHINGS

Installing Anaconda through-wall flashing at the corners offers no problem to the sheet metal worker as standard one-piece Anaconda corner flashings are available for both inside (internal angle) and outside (external angle) corners. In most through-wall flashings of corrugated design it is impossible to lap one flashing over the other because it would result in a "fat mortar joint". In common brickwork such a thing can be tolerated, but not with face brick or with stonework where the mortar joint is only a 1/4" thick. Tailoring or mitering with snips and making a soldered joint is sometimes resorted to, but is often attended by considerable delay and a botchy appearance, beside an unwelcome bother and expense.

Anaconda one-piece corner flashings for inside and outside corners interlock and nest perfectly with the adjoining straight flashing. There is no building up of metal, except an additional thickness of copper at the lap and the mortar joint at the corner can be just as thin as elsewhere along the wall.

Anaconda outside corner flashings are stamped from a blank of copper to form a perfect dam on the outer edge with precision made corrugations, and with an integral weather lip on the drain side to make an absolutely weather-tight corner when the several pieces of flashing are properly placed. The inside corner flashing as the name implies is for a corner with an internal angle. This flashing is furnished to the sheet metal contractor flat with an integral dam on the outside of the wall, and a plain selvage on the drain side which is to be formed into a vertical counter flashing at the corner. When all the flashings are in place, including the base flashing, the counter flashing flange is made weather-tight by interlocking or lapping the vertical flanges and making them secure either by malleting or by soldering.

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Full information on the Anaconda Through-Wall Flashing is contained in Anaconda Publication C-28.

ROOFING – STANDING SEAM (ROLL METHOD) A.I.A. 12

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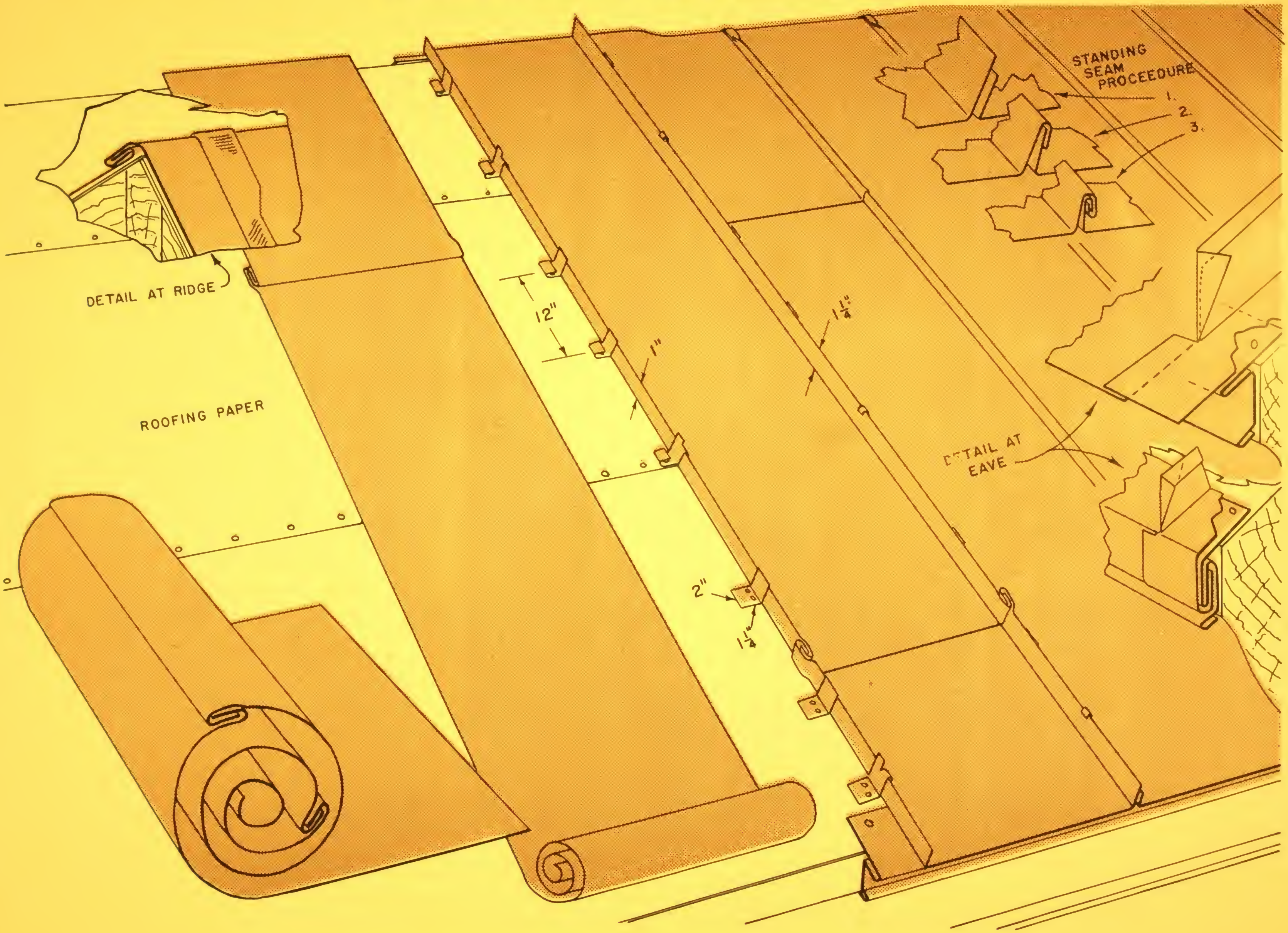

ROOFING - STANDING SEAM (Roll Method)

The roll method of applying standing seam copper roofing originated with the terne plate steel roofs that were popular some years ago. Such roofs generally had locked and soldered cross seams and were painted after being installed. They were usually applied on roof decks having a slope ranging from 2" to 6" per foot.

The roll method of standing seam roofing has been used successfully with 10 oz. Economy Copper Roofing furnished in strips 16" wide and 72" long. The 10 oz. material lends itself particularly well to this method of construction because the gauge is practically the same as that of terne steel roofing, and, of course, the ductility of copper and its excellent forming qualities are advantages which mean savings in energy and time.

16 oz. copper of roofing temper can also be applied by the roll method, but the work is somewhat harder. Since the sheets are wider, requiring less seams, the pan method with standing seam construction seems to be preferred when 16 oz. copper is used.

The drawing shows the strips of copper joined together endwise with 3/4" clinch locks without solder. In order to keep the strips in alignment indentations are made with a center punch at both edges of the cross seams. The strips are then loosely wound into rolls for easy handling and again unrolled on the roof deck where the edges are turned up with edging tongs. One edge is 1/4" higher than the other to form the first fold of the double lock standing seams. The seams are then completed with the seaming tong or "kicker", except at the ridge and the eave where the work is done with hand seamers and regular sheet metal tools. The upstanding edges of the roof pans are 1" and 1-1/4" for a finish standing seam 3/4" high.

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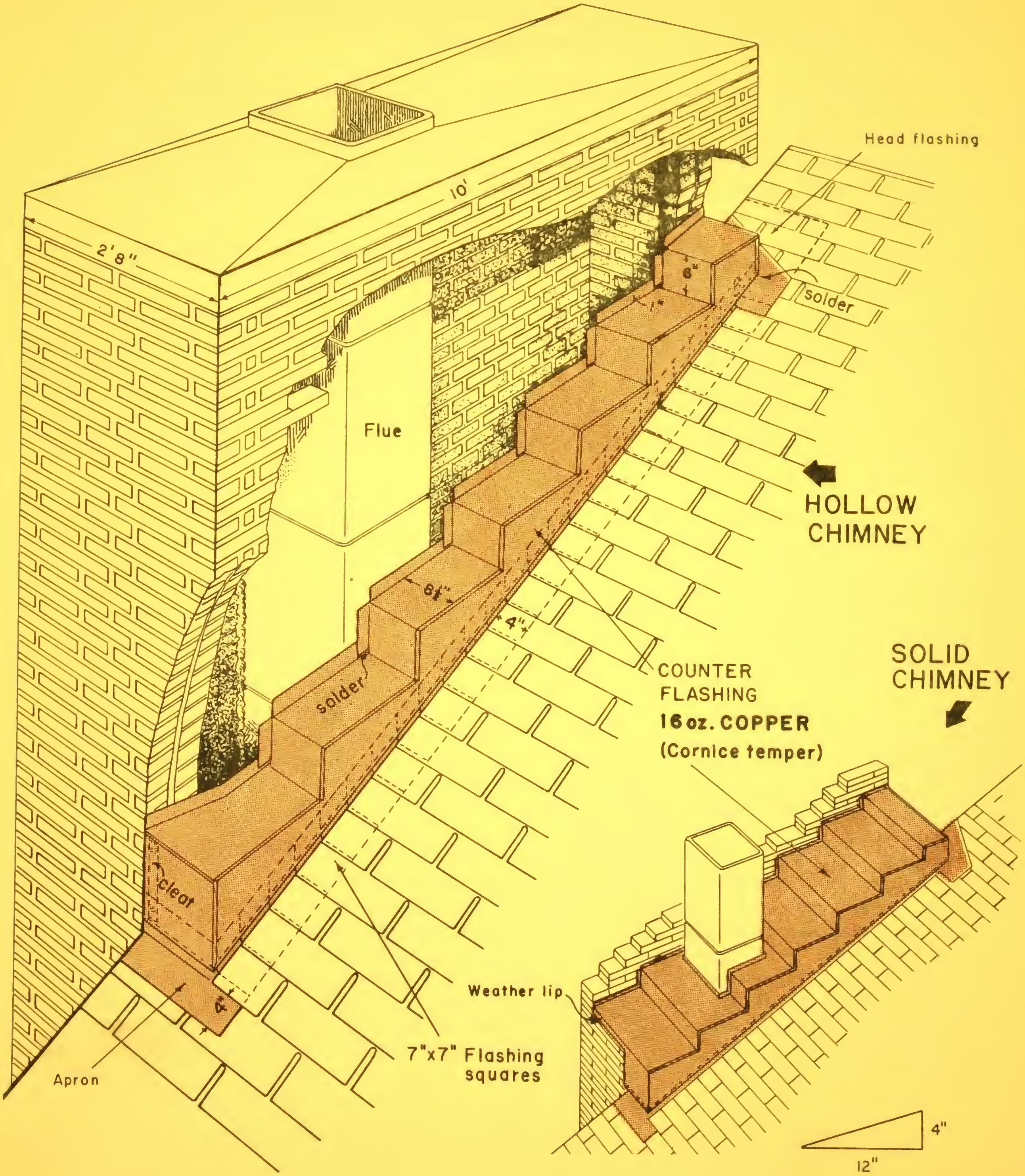

FLASHING, CHIMNEY OF ARCHITECTURAL DESIGN

A.I.A. 12

CHIMNEY FLASHINGS

The question has been asked as to why changes are necessary in the method of flashing chimneys when there are many homes which were built in Colonial days where the original chimney flashings are apparently serving well. The reasons which have necessitated some changes in chimney flashing designs as applied to modern construction are:

1. Chimneys built in Colonial times were usually massive affairs often measuring 4' x 6' at the roof and 20' square in the cellar. Moisture which penetrated the chimney above the roof was absorbed by this large mass of masonry and the almost daily use of the kitchen stove or chimney ovens helped to evaporate this moisture before it reached interior walls and ceilings.

2. The lime mortar used years ago penetrated the brick or stonework and after a time had somewhat of a waterproofing effect.

Thus the major function of chimney flashings at that time was to seal the openings between the chimney and roof. Strips of metal were leafed into the shingle cources and the ends of the strips tucked into the mortar joints of the chimney. Later as caulking compounds and roofing mastics became available these materials were used to close up the joints and holes against the passage of water. However, this is unsightly and is not considered first-class, permanent construction.

In modern chimneys, flue lined, masonry is kept to a minimum with the result that water which is absorbed above the roof level may very likely find its way to interior partitions or ceilings. Furthermore, the cement mortar commonly used today does not have the sealing properties of lime mortar so that wind-driven rain more easily penetrates the masonry and mortar joints. It is important that this water, which has been absorbed by the chimney, be intercepted and drained out to the roof.

A through-to-flue counter flashing of copper installed over a copper base flashing, as indicated by the drawing on the reverse side, serves this purpose. Note that the counter flashing is turned up 1" at the flue so that all water is drained to the outside.. The base flashing of 7" x 7" copper squares is laid at the time the roof is shingled.

The through-to-flue counter flashing is fabricated by the sheet metal contractor to the chimney dimensions and installed when the masonry construction reaches the desired levels above the roof. Joints in the shop-fabricated counter flashing are clinch locked where possible and blind soldered on the reverse side. For neater appearance and additional rigidity the bottom edge of the counter flashing; the apron of the base flashing and other exposed flange areas may be folded under 1/2" to form a hem. Where necessary this hem also serves to hold the metal to cleats fastened to the structure. The copper used for both the counter flashing and base flashing should be at least 16 oz. gauge and of cornice temper (cold rolled).

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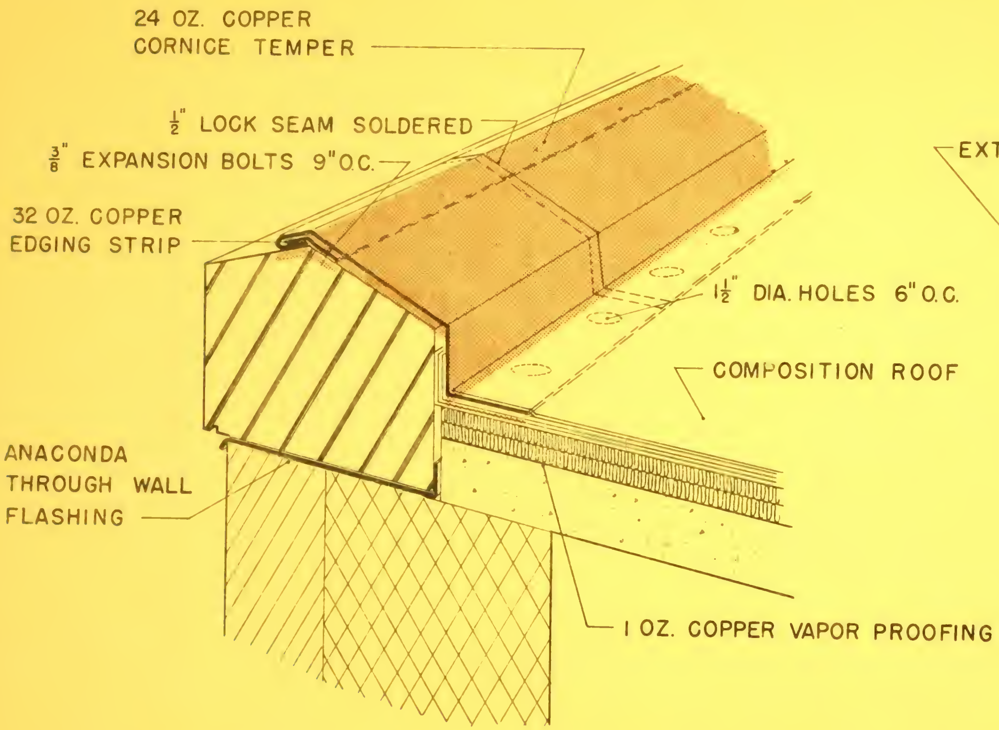
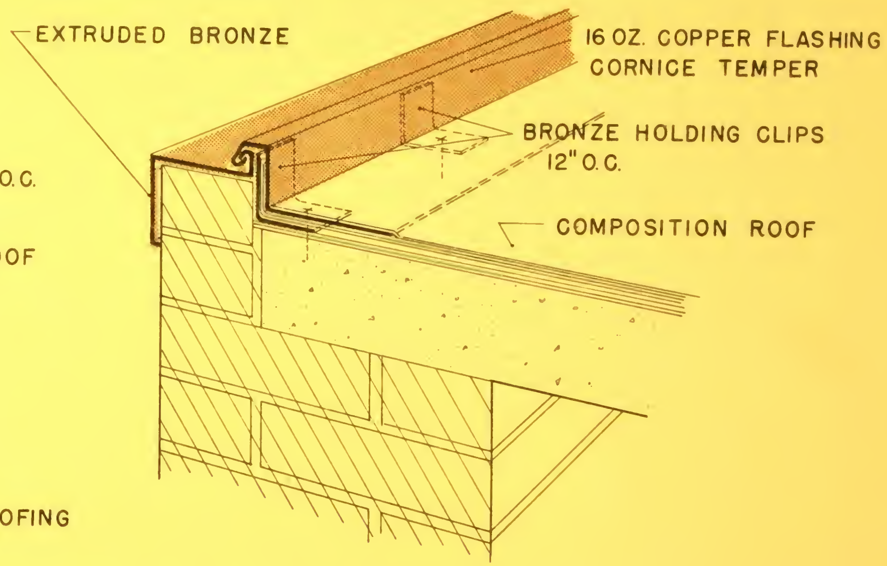


STONE COPING



ARCHITECTURAL BRONZE COPING

COPPER FLASHING AT COPINGS

The austereness of modern or functional design in which the parapet wall has been eliminated has made it necessary to develop new details of construction at the junction of the roof and side wall. In keeping with the stone age in architecture and for buildings of classic design the finish in this location is often made with stone copings. If the design is modern with metal windows and trim, the coping too may also well be of metal.

In flashing a stone coping as shown on the drawing it is desirable to well cover the coping with copper, but not to show from the street. Such a covering will do away with the problem of making the vertical joints in the stone coping weather-tight, which is generally conceded to be almost impossible.

The flashing as shown is of 24 oz. cold rolled copper of cornice temper because the broad plain surface needs this additional thickness and stiffness. With copper of such a gauge it is important that the flashing flange be fastened securely to the roof deck at intervals of not over 12" so as to avoid the possibility of breaking the bond between the copper and the brittle bituminous binder of the built-up roofing in cold weather. For additional security in this respect, the drawing shows holes in the flashing flange which allows the bitumen to bond through from top to underside, thereby getting the benefit of cohesion as well as adhesion. The copper end joints of the flashing should be cleaned, pretinned, locked and soldered, and expansion joints should occur at all expansion joints in the building.

The detail of an architectural bronze coping may be made to suit the designer, provided certain practical and extrusion mill limitations are observed. In general the cross section of an extruded shape should fit inside a 6" diameter circle, and for a section of that size a 1/8" thickness is more or less standard. Extrusions of that kind can be had in lengths up to 20' or more, but are probably most easily handled in 10' or 12' lengths.

This cresting is of a form that lends itself to true alignment and provides a weatherproof interlock for the copper flashing that is built into the composition roofing. The coping or cresting is held in place by bronze holding clips brazed to the extrusion and fastened to the roof deck by means of bronze screws and expansion shields. The end joints in the pieces that make up the coping should be cut square and brazed with a hair line joint using silver solder or phos-copper brazing rod.

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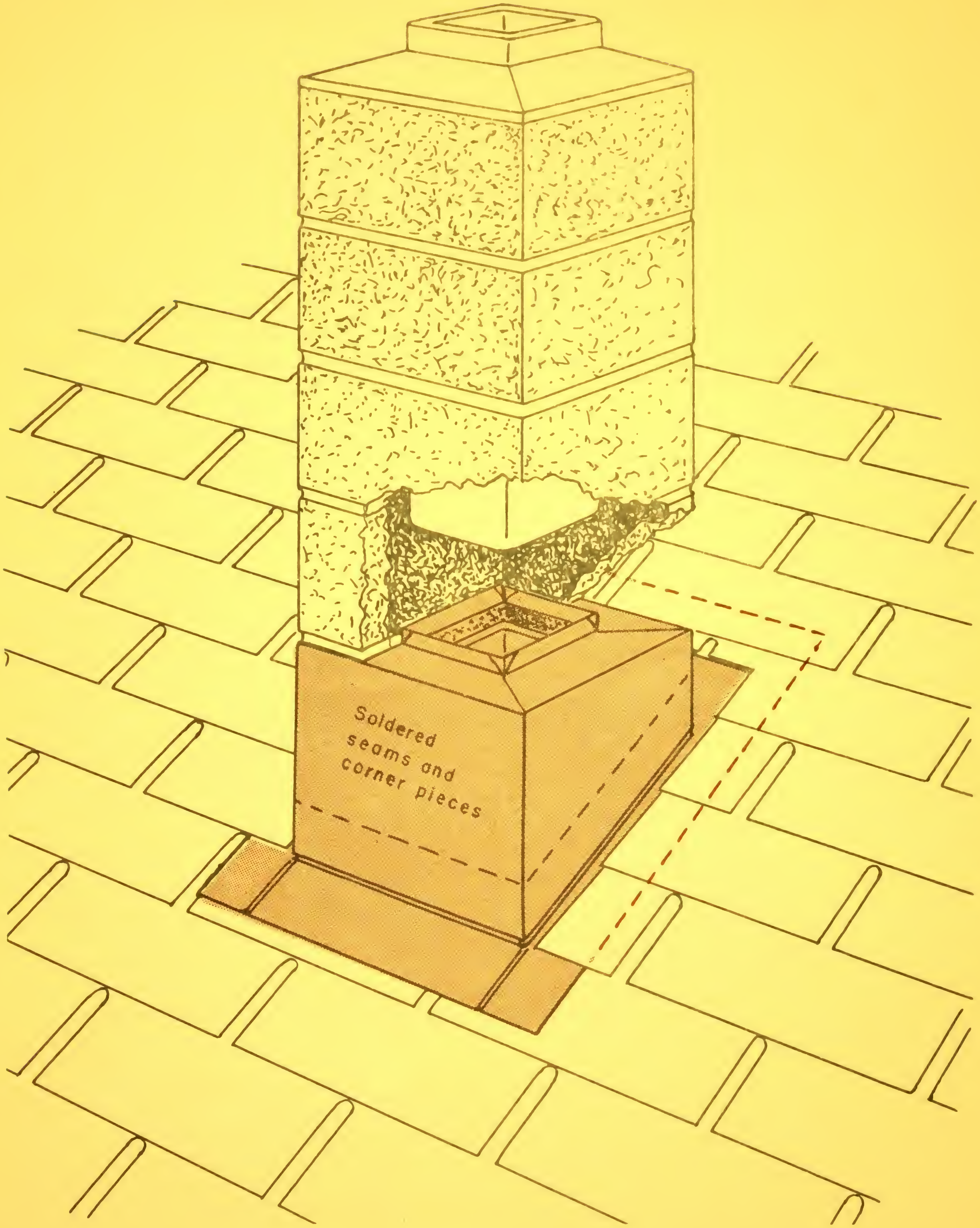

FLASHING, CHIMNEY OF CEMENT BLOCK CONSTRUCTION

A.I.A. 12

FLASHING, CHIMNEY OF CEMENT BLOCK CONSTRUCTION

Anaconda Sheet Copper

The increase in popularity of artificial stone and cement blocks made with cinders or sand as a coarse aggregate has resulted in new uses of those materials, including cement blocks for standard size chimneys in small homes.

The principle of flashing cement block chimneys is the same as for chimneys of stone or brick, but the standard 8" height of the courses introduces a practical problem in sheet metalwork. For an ideal job the base flashing would be made exactly the same as for chimneys of brick or stone, but the counter flashing should be carried through to the flue at one level, as indicated in the drawing.

Cement blocks are quite porous and absorptive and for large chimneys using this class of material it is imperative that the counter flashing be carried through to the flue; otherwise the water absorbed by this mass of masonry may without much trouble find its way to interior walls and ceilings. For large chimneys of cement block construction located within the roof slope it is suggested that the counter flashing be of the step design. If the chimney construction is thoughtfully laid out so that the steps or horizontal joints come at about the right height above the roof level, the step flashing will present a pleasing appearance and a considerable saving of metal will be achieved. Ordinarily the returns of the vertical steps in the counter flashing of a large chimney are also carried through to the flue (see drawing in this folder entitled "Flashing, Chimney of Architectural Design"). Should the architect choose to omit the returns, the exposed steps of the counter flashing which lie against the face of the chimney should be hemmed and clinched to a concealed holding cleat at the exposed vertical edge, the purpose being to avoid ugly fish mouthing of the vertical flashing, or the possibility of rain or fine snow being driven into the crevices.

The accepted standard gauge of copper for chimney flashings is 16 oz. per sq. ft. and for best appearance the copper should be of cornice temper although the copper for the base flashing, particularly the part that is concealed, could be of roofing temper. The bends should be made with a standard bending brake; the joints clinch locked and, where required, the joints should be soldered on the reverse side (blind soldered). For best results the work should be done by a competent sheet metalworker with regular sheet metalworking tools.

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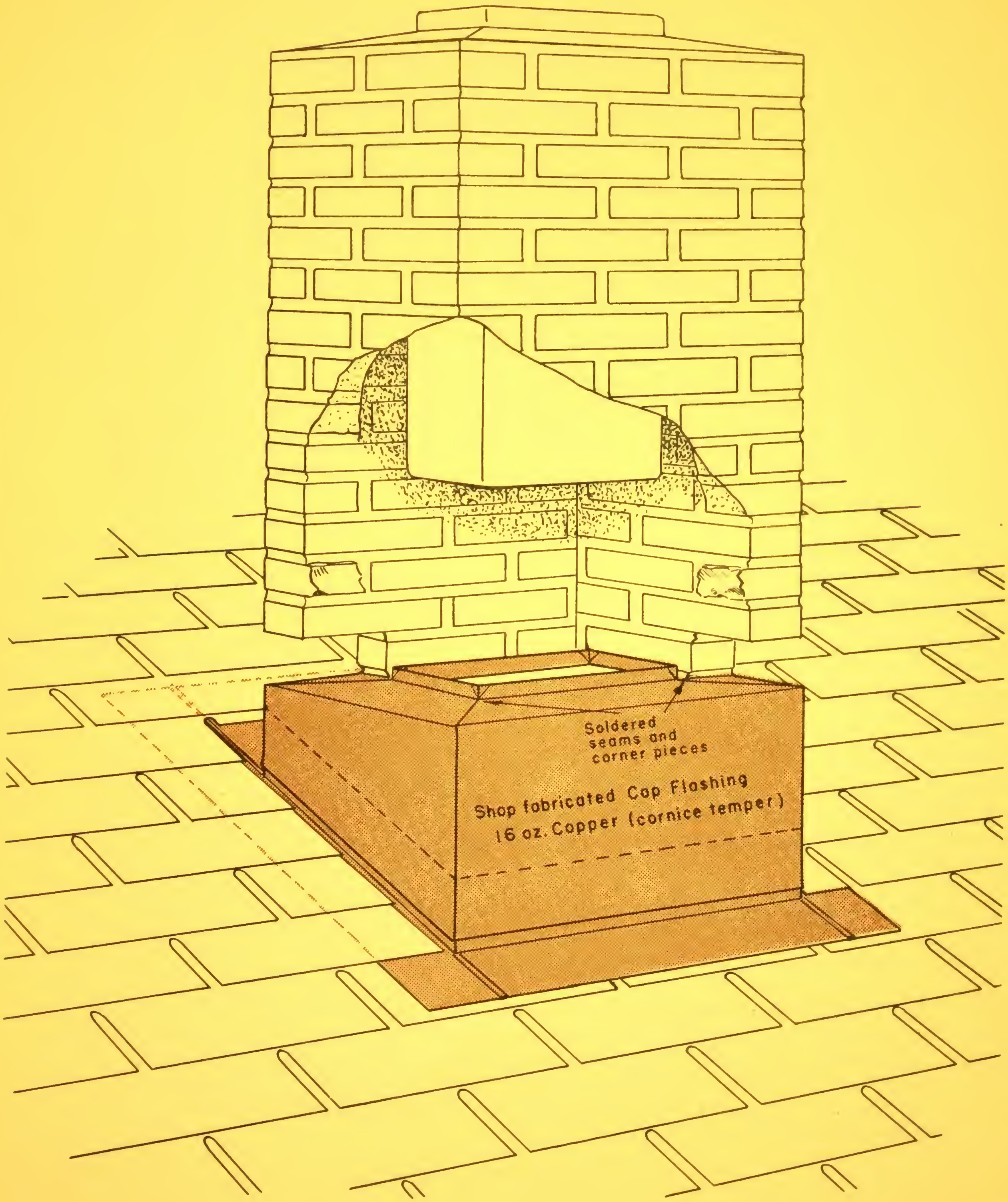
FLASHING, CHIMNEY IN SLOPE



A.I.A. 12

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

FLASHING - CHIMNEY IN SLOPE

Anaconda Sheet Copper

This drawing shows a chimney on the slope of a roof. This style of chimney and flashing is particularly adaptable to low pitch roofs on bungalows and ranch houses and for buildings of contemporary design with a slope of 3" - 6" per foot. The chimney has a single flue 8-1/2" x 13" and is flashed with 16 oz. copper of cornice temper. The base flashing is shown to be made up in the shop in the form of a flashing flange with an apron about 4" wide overlapping the shingles and a head flashing about 12" wide. There is no cricket behind the chimney. The flashing flange at the sides of the chimney is also shown to be about 4" wide so as to make certain that the rain water will flow downward beyond the chimney before it can leach sidewise through to the underside of the shingles. This construction is considered satisfactory for the narrow side of a single flue chimney particularly when the roof is steep, but for larger chimneys individual flashing squares should be built into the successive courses of shingles.

The cap flashing is shown to be shop fabricated of cold rolled copper and in this case has a level top surface because of the gentle slope of the roof. In accordance with recognized good practice the copper is carried through the masonry to the flue and turned up about an inch to make sure the rain water that is intercepted by the flashing will be diverted to the outer face of the flashing or chimney. All of the exposed seams in the cap flashing as well as in the base flashing where soldering is necessary should be blind soldered for best appearance.

In laying out the flashing, the height of the upstanding leg of he base flashing at the back of the chimney should not be less than 4". On that basis, and without resorting to steps in the design of the cap flashing a considerable breadth of copper will show, all of which is favorable provided the work is well done and nicely finished. Such a flashing when formed in the shop with the benefit of a bending brake, a proper soldering kit, and other sheet metal-working tools should result in a very satisfactory installation of flashing, and should contrast with the flapping, gaping, and tarred tuck flashing which is so prevalent today and woefully in want of improvement.

FLASHING, CHIMNEY AT RIDGE

A.I.A. 12

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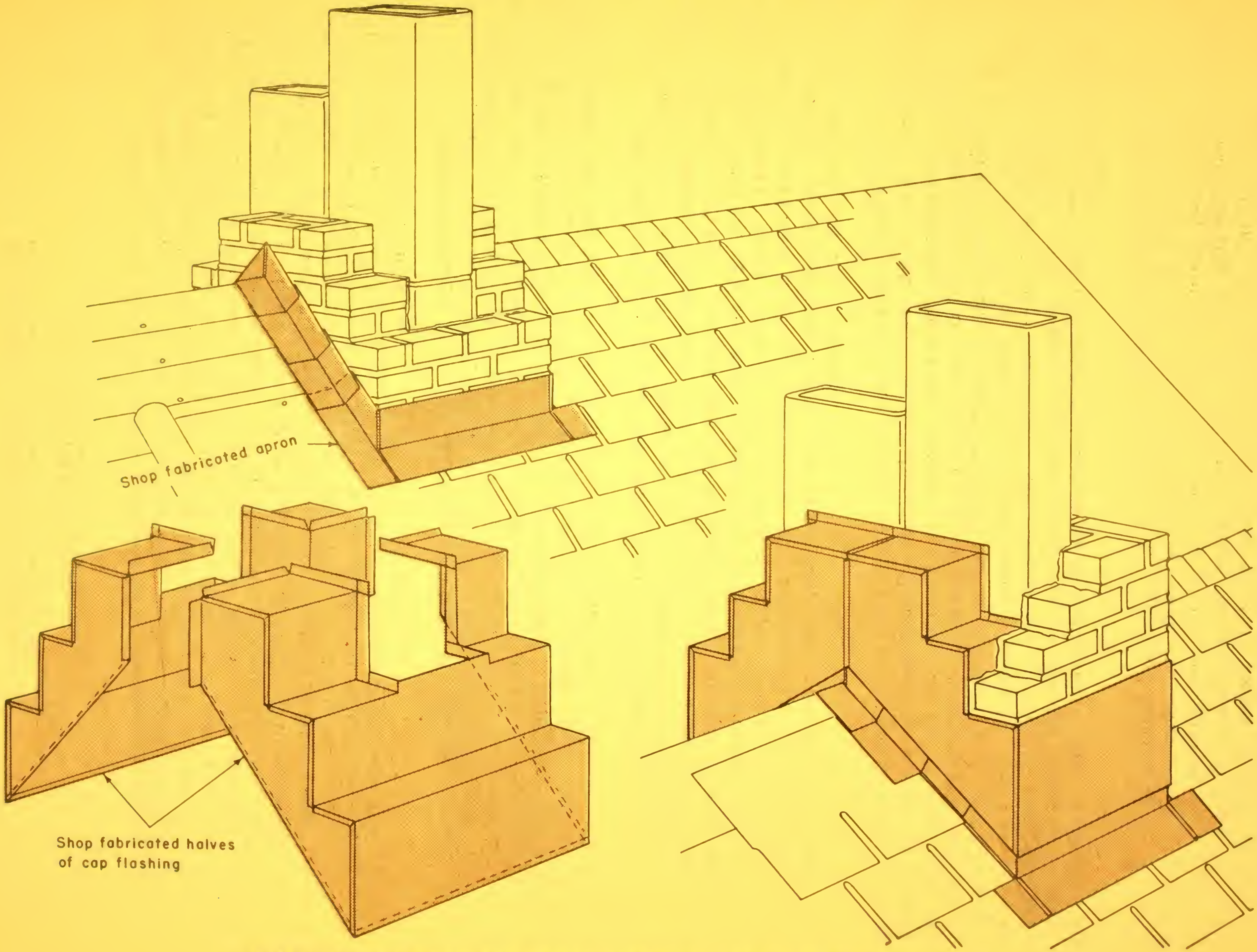

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

FLASHING - CHIMNEY AT RIDGE

Anaconda Sheet Copper

Probably the most favorable location of a chimney is at the ridge. In that location it has the advantage of providing the best draft with the least amount of masonry extending above the roof. From the standpoint of appearance, as well as that of function, a chimney at the ridge is preferred. However, any chimney regardless of its location contributes something desirable to an architectural composition. The designer usually gives little concern to the placing of the chimney, but instead lets it come where it will so long as the interior plan arrangement is good. Whether a chimney is at the ridge, or in the slope, or whether it is only partly in the roof, as in the gable, or at the outside wall elsewhere around the house, - the problem, the method, and the need for flashing is the same.

There is always the base flashing which on steep roofs consists of an apron at the lower edge of the chimney with soldered returns at the corners, and then the ordinary 5" x 7" or 7" x 7" flashing squares are leafed into each course of shingles. The cap flashing is formed at the shop, in a manner as shown on the drawing. It is set in place over steps in the masonry to form a complete counter flashing, and is then built solidly into the brick or stonework of the chimney.

The cap flashing, as well as the apron of the base flashing should be of 16 oz. cold rolled copper of cornice temper for best appearance. The bottom edge of the counter flashing and apron should have a three-quarter inch hem, turned back to facilitate concealed fastening and to provide stiffness. All exposed joints should be clinch locked, and, where necessary, blind soldered on the reverse side. Where the copper cap flashing meets the flue it should finish with a 1" upstand or flange so as to avoid the possibility of draining water to the flue instead of outward from the masonry of the chimney.

The finished appearance of the chimney flashing has considerable architectural value if the work is nicely done. The sheet metalworker should take care not to dent or crease the copper and should wipe the metal clean of flux after applying solder so as to avoid ugly staining. In that case the mason like all building mechanics will have respect for nice work, and will be careful with the mortar. In the interest of appearance the copper could be cleaned by rubbing lightly with steel wool after the mason has completed the chimney above the flashing. The copper can then be left in its natural color or it may be given a wipe or brush coating of linseed oil to bring about the russet brown or oxidized effect.

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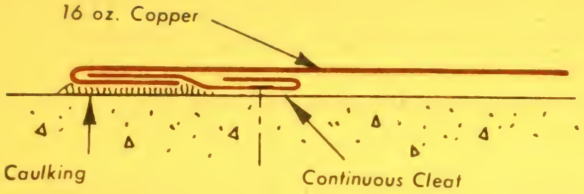
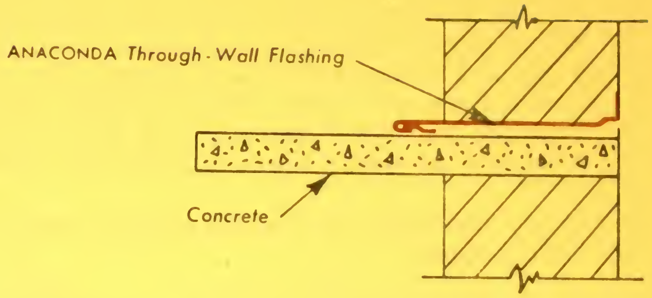
SUN SHADE AND CANOPY, COPPER COVERED

1

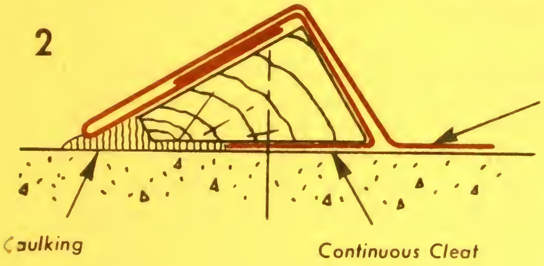


DETAIL

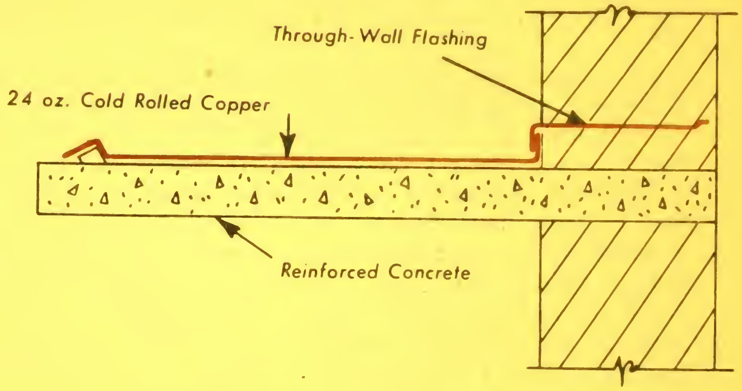


SHADOW LINE

2

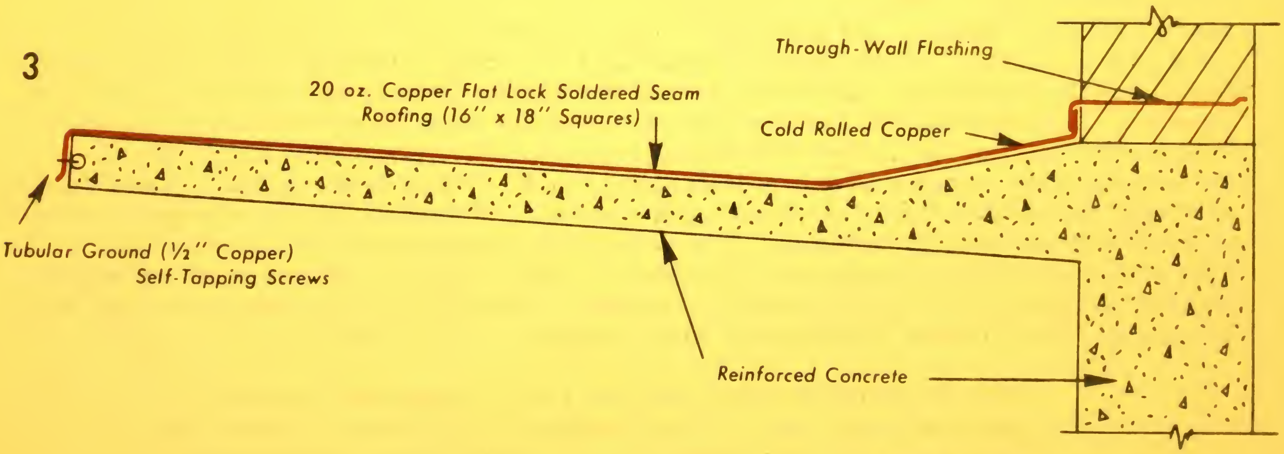


DETAIL



SUN SHADE

3



ENTRANCE CANOPY

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

COPPER COVERED SUNSHADES AND CANOPY

Buildings of what is known as contemporary design depend for ornamentation or decoration on horizontal or vertical projections of reinforced concrete in the form of slab type cornices, band courses, balconies and canopies. This type of construction has proved quite satisfactory in warm climates where frost does not occur, but in colder climates it is necessary to waterproof unprotected concrete to avoid deterioration which might result from the freezing of water from rain or wet snow.

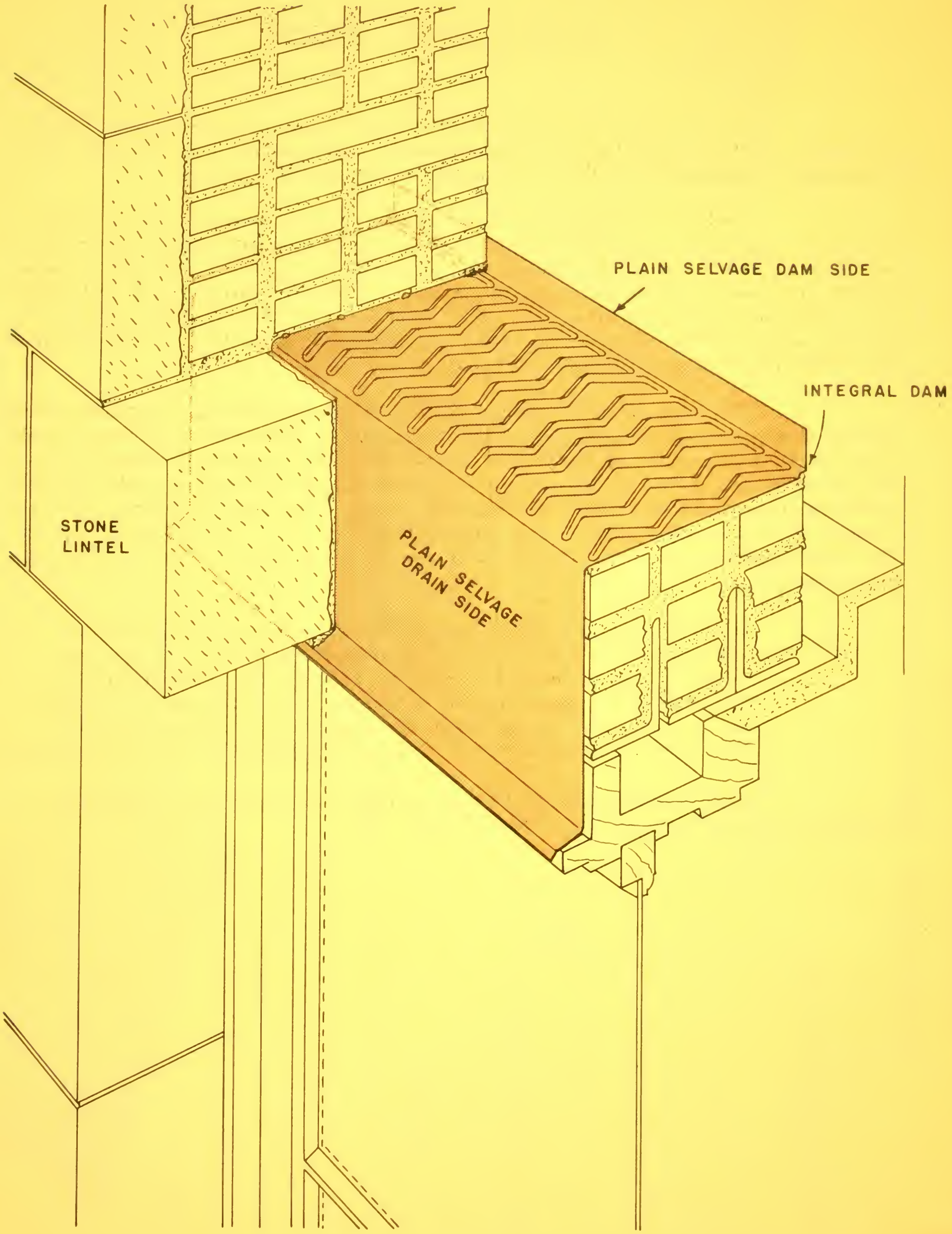
It is, however, a comparatively simple matter to waterproof such projections with copper.

For small projections that are intended principally for architectural shadow lines as shown on drawing #1 for climates where there is no extreme cold weather, the Anaconda Through-Wall Flashing can be used to advantage. The 4" plain selvage on the drain side can be locked to a continuous cleat and sealed with white lead paste or caulking compound so that rain water will not flow into the building at the top side of the projection.

For larger projections that serve the dual purpose of creating interesting shadows and, at the same time, cutting down the cooling load by preventing direct sunlight from passing through the windows during the hottest hours of the day, it seems desirable to cover the entire top surface with copper. Such a scheme is shown on drawing #2 and is labeled "Sunshade". The object in this detail, like that in the one showing the projecting slab for an architectural shadow line, is to keep the copper covering back from the face of the projection, and to leave that edge clear and clean to show a sharp architectural line unspoiled by the usual construction joints of unlike materials at that point. The copper covering is shown to be of 24 oz. cold-rolled stock. This material, because of its cold-rolled temper, would have sufficient strength and resistance to buckling to keep it permanently in good condition, provided upstanding expansion joints were installed at intervals of 40' or less.

Drawing #3 of an entrance canopy is shown to be roofed with regular 20 oz. cold-rolled copper roofing squares, and with a drip edge around the outline, also of 20 oz. copper. At the outer edge a method of fastening the copper covering is shown. This involves placing 1/2" copper tubing in the form before the concrete is poured, thereby casting the tubing in the concrete to serve as a ground. In fastening the copper facing it is only necessary to drill or punch a hole in the wall of the copper tubing and to make the joint with sheet metal screws or with screws of the self-tapping kind. If the holes in the copper fascia are slightly larger than the shank of the screw, it will eliminate the possibility of buckling between fastenings. These screws should preferably be of the Silicon Copper Alloy known as "Everdur". The copper roof covering is made weather-tight at the building wall as shown by means of Anaconda Through-Wall Flashing with Counter Flashing of plain copper on the drain side.

ANACONDA THROUGH-WALL FLASHING



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

WINDOW HEAD FLASHING

It is an acknowledged fact that all masonry walls leak water. Nowhere in wall construction can leaks be so damaging and through-wall flashing so important and necessary as at the window heads.

In building masonry walls nearly every opening has a lintel of steel, and there are many with a shelf angle to support the outer veneer of brick. There are also variations in detail, such as the window frame which may be of wood, steel or aluminum, and the lintel may be of stone as on this drawing, or it may even be in the form of a spandrel made of brick, terra cotta, slate or marble. In any case it is vitally important to do a thorough job of flashing with copper.

The Anaconda Through-Wall Flashing with a 2" upstand formed of the plain selvage on the dam side, and with a wide plain selvage on the drain side can be easily shaped to conform to the masonry construction over the window and is the most certain to drain all of the water to the outside. Window head flashings for individual windows, like sill flashings, are extended 6" beyond the jamb. For wide openings or for band type windows the flashings may be extended by lapping the 8' lengths 3", or 1 corrugation endwise.

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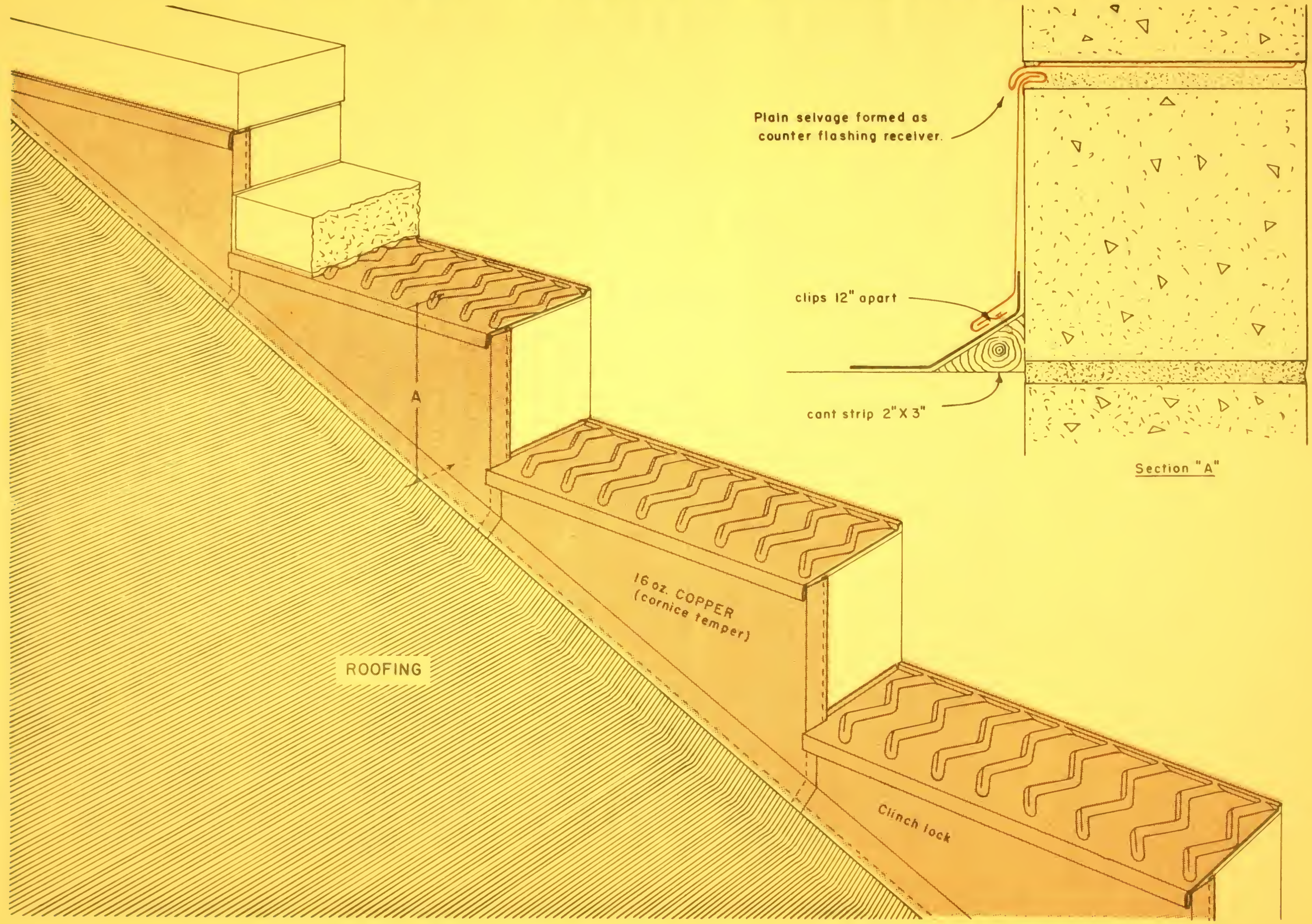
Full information on the Anaconda Through-Wall Flashing is contained in Anaconda Publication C-28.

ANACONDA THROUGH-WALL FLASHING
WITH INTEGRAL COUNTER FLASHING RECEIVER



FLASHING, GABLE AND PARAPET

Anaconda Sheet Copper and Anaconda Through-Wall Flashing

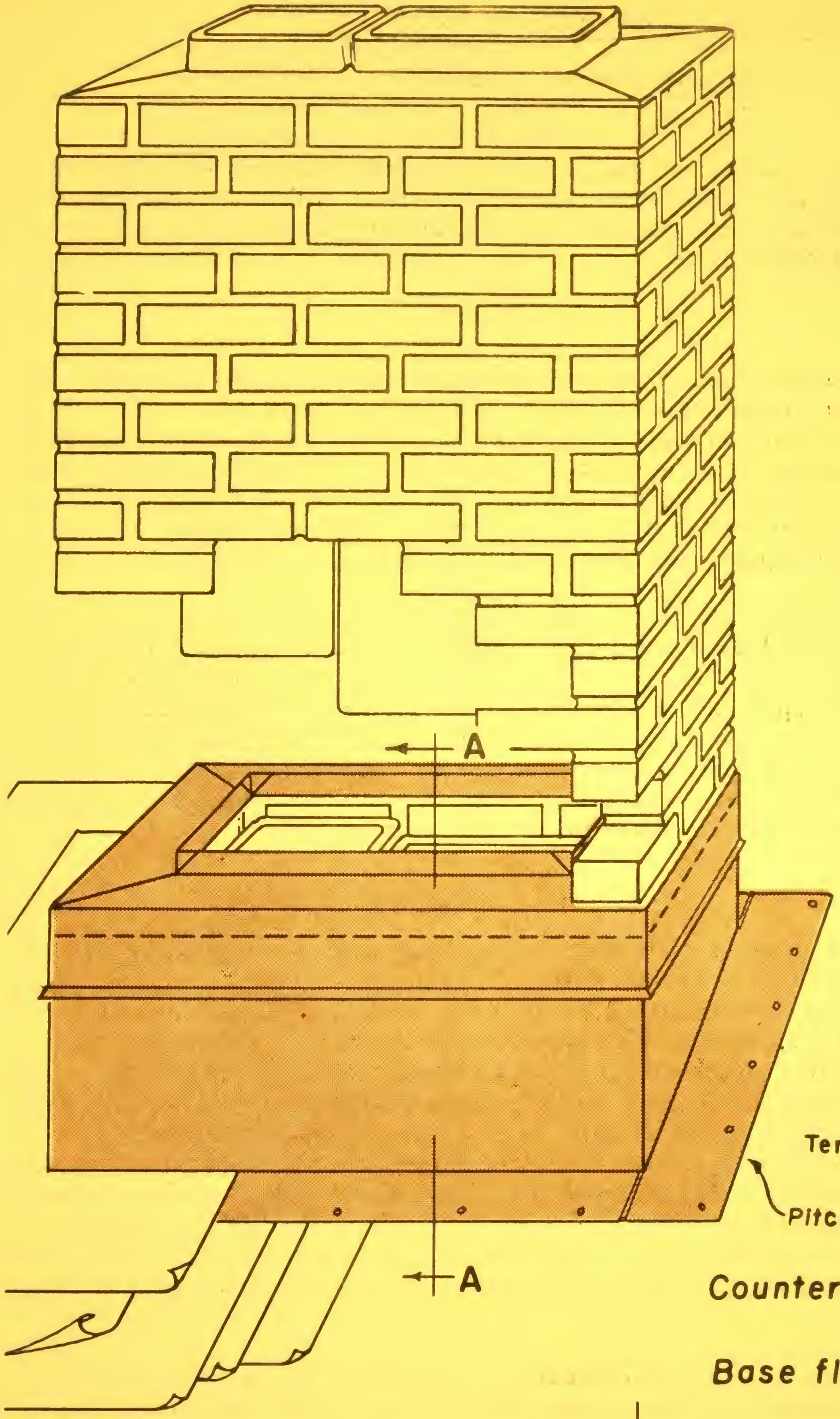
Building lots of city property are usually with a narrow frontage and with a depth considerably greater than the width at the street. In many cases, as a matter of economy, such a building will have a gable roof, but with an architectural front to conceal the gable. The portion of the front extending above the roof line becomes a parapet wall.

To build a gable end and a parapet wall of cement blocks as shown on the accompanying drawing calls for a method of flashing that is considerably different from what is commonly done with walls of brick where there are ever so many horizontal and vertical joints into which the flashing can be built. The flashing as shown accommodates the regular cement block construction with 8" courses allowing for breaking joints and, of course, the exposed ends of the blocks are closed or finished smooth by the manufacturer.

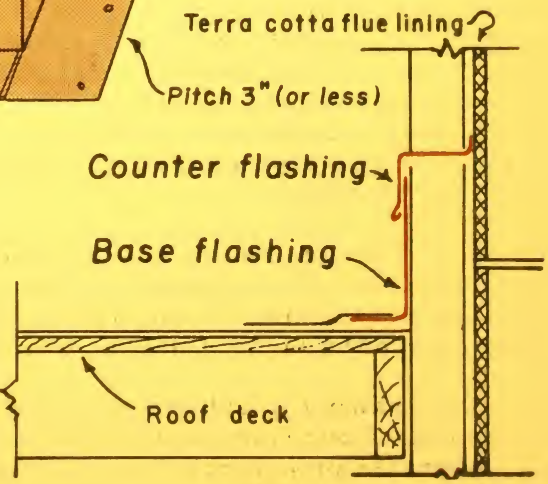
The copper through-wall and counter flashing shown is of two parts making use of the counter flashing receiver feature that is particularly well suited to the Anaconda Through-Wall Flashing with its plain selvage. The base flashing in this scheme is omitted because the built-up roofing is carried up over and above the cant strip. The counter flashing is held by a continuous cleat which can be raised and the bottom of the flashing fastened down again whenever the roof covering is renewed.

ANACONDA SHEET COPPER

FLASHING, CHIMNEY IN FLAT ROOF



Section A—A



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

FLASHING, CHIMNEY IN FLAT ROOF

Anaconda Sheet Copper

For houses of modern design or for apartment houses and commercial buildings the chimney may come through a roof with a pitch of less than 3" per foot, or what might be called a flat roof. The flashing for such a chimney can be quite simple and yet thorough.

The Base Flashing

The base flashing for small chimneys should be made up of 16 oz. copper, cornice temper, and 20 oz. copper for large chimneys. The cornice temper is important with this style of chimney flashing because the copper is nailed or otherwise fastened solidly to the roof deck. The cold rolling of copper to obtain a cornice temper imparts additional stiffness to the metal so that it can withstand the temperature stresses that will come about due to weather changes and the rigid fastening of the flashing.

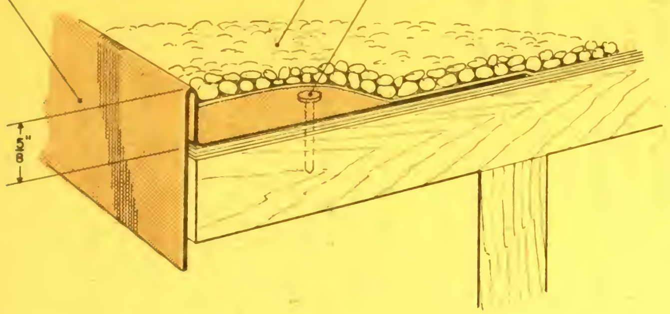
Base flashings for chimneys on flat roofs must be soldered at all joints because the flashing has to be water-tight - not just weather-tight as in the case of the steep roof flashing. There is always the possibility that a roof drain may become plugged and that an actual head of water will develop around the chimney. An especially neat and workmanlike appearance will result from the use of copper of cornice temper. Therefore, in keeping with this desirable feature, all soldering at the joints should be neatly done and preferably on the reverse side where it cannot be seen.

The Counter Flashing

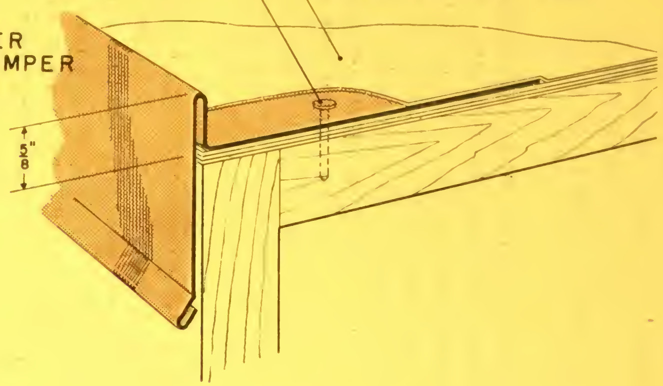
More often than not, a chimney that rises above a flat roof has considerable height so as to avoid down draft. This necessitates an additional thickness of masonry around the flue lining, but whether the thickness is 4" or more it is important to carry the copper counter flashing through the masonry and to turn it up about an inch at the outer surface of the flue. This is particularly important because a large chimney, and one that is tall with heavy walls, will absorb a great deal of rain water which, if allowed to gravitate downward within the masonry without being intercepted by flashing, may cause serious damage. Many chimneys have been built with the counter flashing only tucked into the mortar joint an inch or so with the unhappy result that repairs were continually required and the fault cannot be corrected without taking down the entire chimney to the roof line and flashing it again in a proper manner.

The copper for the counter flashing, like that for base flashing, should be of cornice temper and the joints should be locked and soldered so that any percolation of water from the chimney above will be intercepted and drained over the outside of the base flashing and onto the roof.

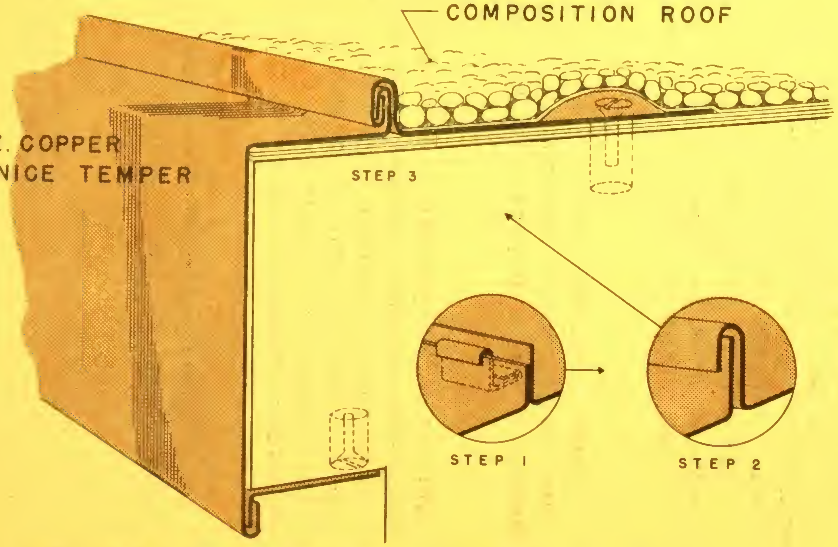
ANACONDA SHEET COPPER



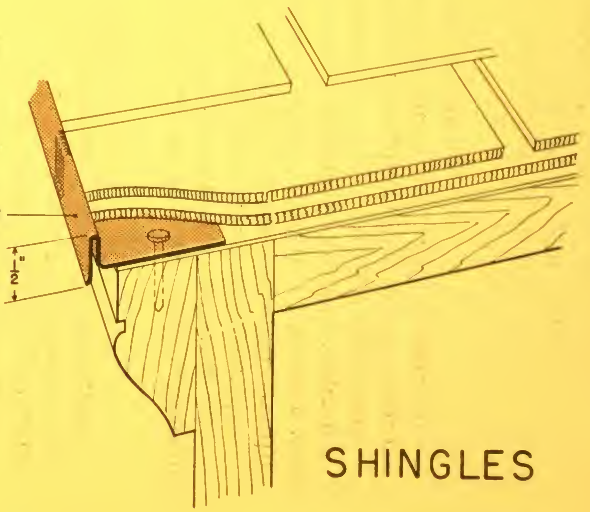
AT OVERHANG



AT FASCIA BOARD



SEPARATE GRAVEL STOP & EDGING



SHINGLES

ANACONDA AMERICAN BRASS LIMITED — NEW TORONTO, ONT.

ROOF EDGINGS OF COPPER

All roofing materials whether for flat roofs or for steep roofs require edgings and flashings. The more durable edgings and flashings are of metal, and the most suitable metal is copper.

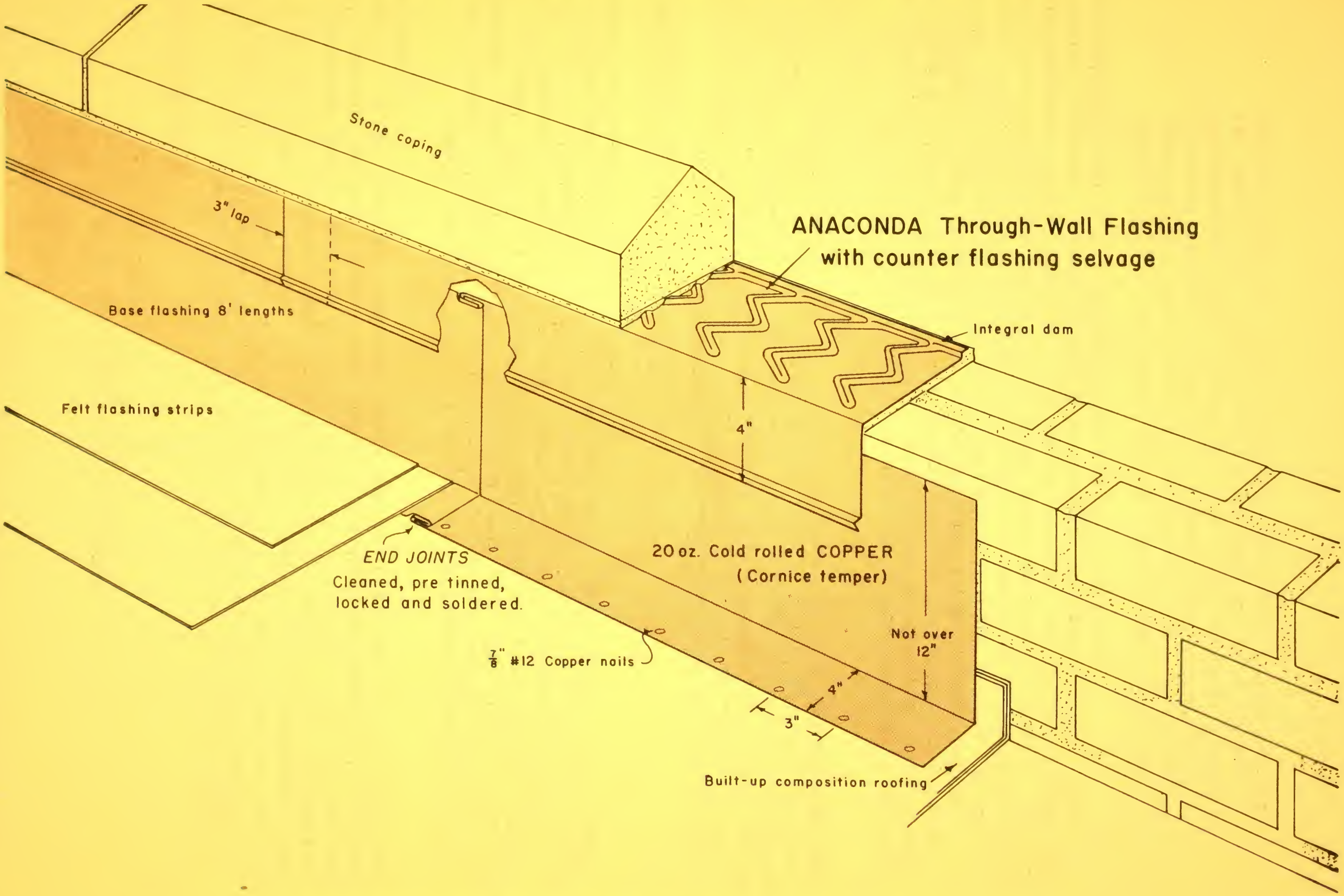
The detail drawing showing an edging at the overhang is for the simplest kind of construction with wood sheathing and built-up composition roofing. The copper flashing is made from a strip 6" wide having a 3-1/2" flashing flange, a 5/8' gravel stop, and a drip edge extending at least a 1/4" below the bottom of the sheathing. Normally these flashing strips are made in 8' lengths lapped and soldered and securely nailed through the felt to the roof boarding or sheathing.

The edging at the fascia board is similar to that at the overhang, except that the outer face of the edging is slightly deeper for architectural effect, and the bottom edge is turned back to form a hem which is canted outward to serve as a drip.

The drawing showing a separate gravel stop and edging for a built-up composition roof on a concrete deck is somewhat more decorative, and is designed to show a minimum of waviness or buckling. The facing strip is free to slide by virtue of the clinch lock seam at the top and bottom edges. The standing seam at the top is rolled toward the outside and serves as a gravel stop for the flashing strip that is built into the plies of the composition roofing. The seam being set back from the edge sufficiently to be inconspicuous when the building is seen at a reasonable distance away. The seam at the bottom is formed of a simple clinch lock joining the fascia with a stiffening strip at the soffit to insure a trim appearance and to provide a drip at the bottom edge. The flashing strip, the cleats for holding the standing seam, and the strip at the soffit are all attached to the construction at intervals of about 12" with durable fastenings, preferably with screws and expansion shields of brass and bronze. The end joints of the flashing should be cleaned, tinned, locked and soldered whereas the joints in the fascia can be without solder, but should be clinch locked and the horizontal portion at the top filled with white lead or caulking compound.

For shingle roofs where workmanship is important, and niceness of finish is desired, an edging strip of copper as shown on the drawing for shingles is suggested. This edging strip assures alignment of the shingles at a gable and at the end of every slope. Such a strip will save considerable time that would otherwise be consumed in trimming the shingles, whether they be of slate, asphalt composition or wood. Such an edging provides a hard surface to resist the pressure of a ladder or damage from causes that are incidental to the care and maintenance of roofing, and probably most important of all - the copper edging introduces a destinctive note, and a well defined sharpness of line to the architecture of the building.

ANACONDA THROUGH-WALL FLASHING



ANACONDA AMERICAN BRASS LIMITED — NEW TORONTO, ONT.

ROOF AND PARAPET FLASHING

Base Flashing

Because the junction of the roof deck and the parapet is subject to movement caused by settlement, shrinkage, expansion and contraction, it is important that a flashing material be used which is not only strong and durable, but of a type which can be installed properly. Copper of cornice temper (cold rolled) and of a suitable gauge corresponding to the scale of work meets these requirements better than any other material. It is durable. Its yield strength will withstand normal stresses developed by building movement or temperature changes. It has excellent soldering properties so that joints can be made tight and strong.

Usually strips 8' long, with widths determined according to the job requirements, are employed. The soldering of joints should be carefully done. The ends of the strips should be cleaned and pretinned. The clinch locked joints are malleted, fluxed and soldered at the right temperature so that the solder will fill the seam and make a strong, water-tight joint. Of equal importance is the use of sufficiently heavy gauge copper to compensate for stresses caused by building movement or expansion and contraction of the metal. The copper should be of cornice temper (cold rolled).

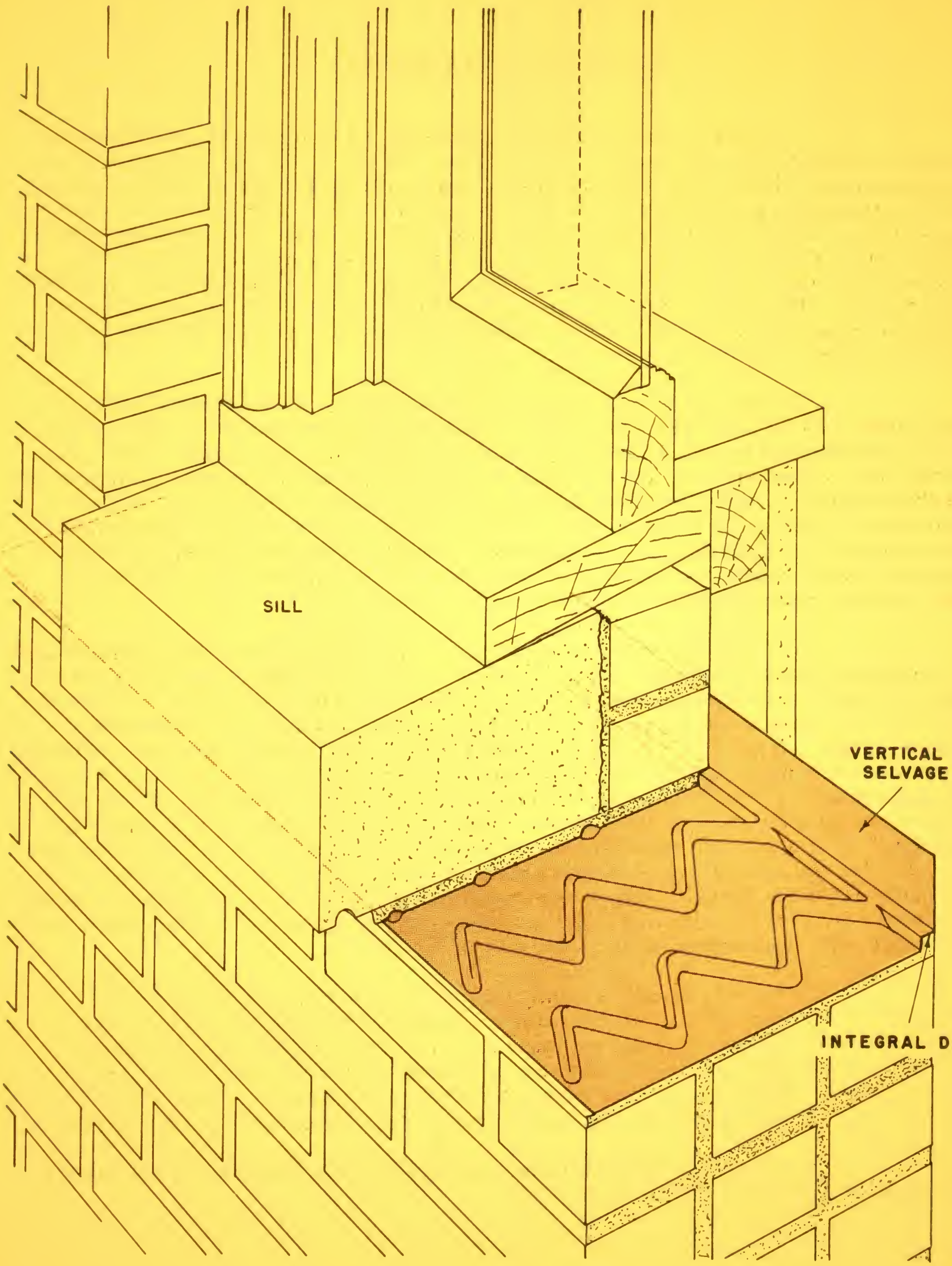
Counter and Through-Wall Flashing

A masonry parapet which is exposed to the weather on both sides becomes water saturated during heavy rains due to the double action and force of suction and pressure on the wall caused by strong winds. Rain water driven into the wall by these forces will percolate down through the masonry to interior surfaces. Thus, in addition to the base flashing, a well designed parapet and flat roof construction will also specify a counter flashing and through-wall flashing.

The best form of counter flashing is one that is integral with the through-wall flashing. Refer to the drawing on the reverse side and you will note that the plain selvage of the Anaconda Through-Wall Flashing is easily bent down at a right angle to form a neat, weather-tight counter flashing - but this is not the only advantage offered by the Anaconda flashing. It has a maximum bearing surface of plain copper and its embossed herringbone design offers the greatest resistance to horizontal shear in every direction. The dam is press formed in the flashing. The smooth selvage may be bent without distortion or humping - thus eliminating the forming of water pockets. The Anaconda Through-Wall Flashing drains dry on a level bed.

This drawing is submitted only as a suggested method of application or use of our Company's products. Since our Company does not supervise or control the installation of, workmanship upon, or ultimate use of its products, it does not assume any responsibility regarding the same beyond that provided for in the Company's published Terms of Sales.

ANACONDA THROUGH-WALL FLASHING



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

WINDOW SILL FLASHING

In the construction of window sills for masonry buildings the matter of shedding rain water is important. In the early days elaborate precautions were taken to prevent the water from getting through to the interior. It was customary to extend the sill 4" beyond the jamb, thereby forming a lug and to cut a wash into the top surface of the sill. It was also regarded good practice to rabbet the stone sill and to insert a brass spline or water stop between the top of the stone sill and the underside of the wood sill of the window frame. Then there was the practice of extending the blind stop of the window frame into the jamb of the masonry to form a wind brake and to prevent the entry of wind driven rain.

Because of practical difficulties and added expense the lug sill of old has become the slip sill of today which means that the sill is cut to fit between the jambs of masonry with a vertical mortar joint at the ends of the sill. The spline is oftentimes replaced with elastic caulking compound and the window frame is likewise made storm-tight with caulking, whether the frame is made of wood or steel. All of this makes faster, simpler and less expensive construction, and requires only the addition of through-wall flashing which when correctly installed results in construction at the sill that is waterproof and better than ever before.

The Anaconda Through-Wall Flashing with its integral dam and herringbone design corrugation is ideal for window sill flashing. It is available in copper of 16 oz. gauge in various widths and plain selvages. The detail shows a regular flashing for a 12-1/2" brick wall with a 2" upstanding flange on the inside. The purpose of this flange is to direct the water that may flow down the inner face of the brick wall to the mortar joint above the copper through-wall flashing where it will find its way to the outer face of the wall across the top surface of the copper flashing. The through-wall flashing is extended 6" beyond the jamb so as to offer positive protection below the mortar joint at the end of the stone sill where rain water is quite certain to leak through in time. In fact, leaks are most likely to occur at the jamb or bottom corners of the window frame, at the sash, and, of course, in the joints under the wood sill, and between the sash and stool.

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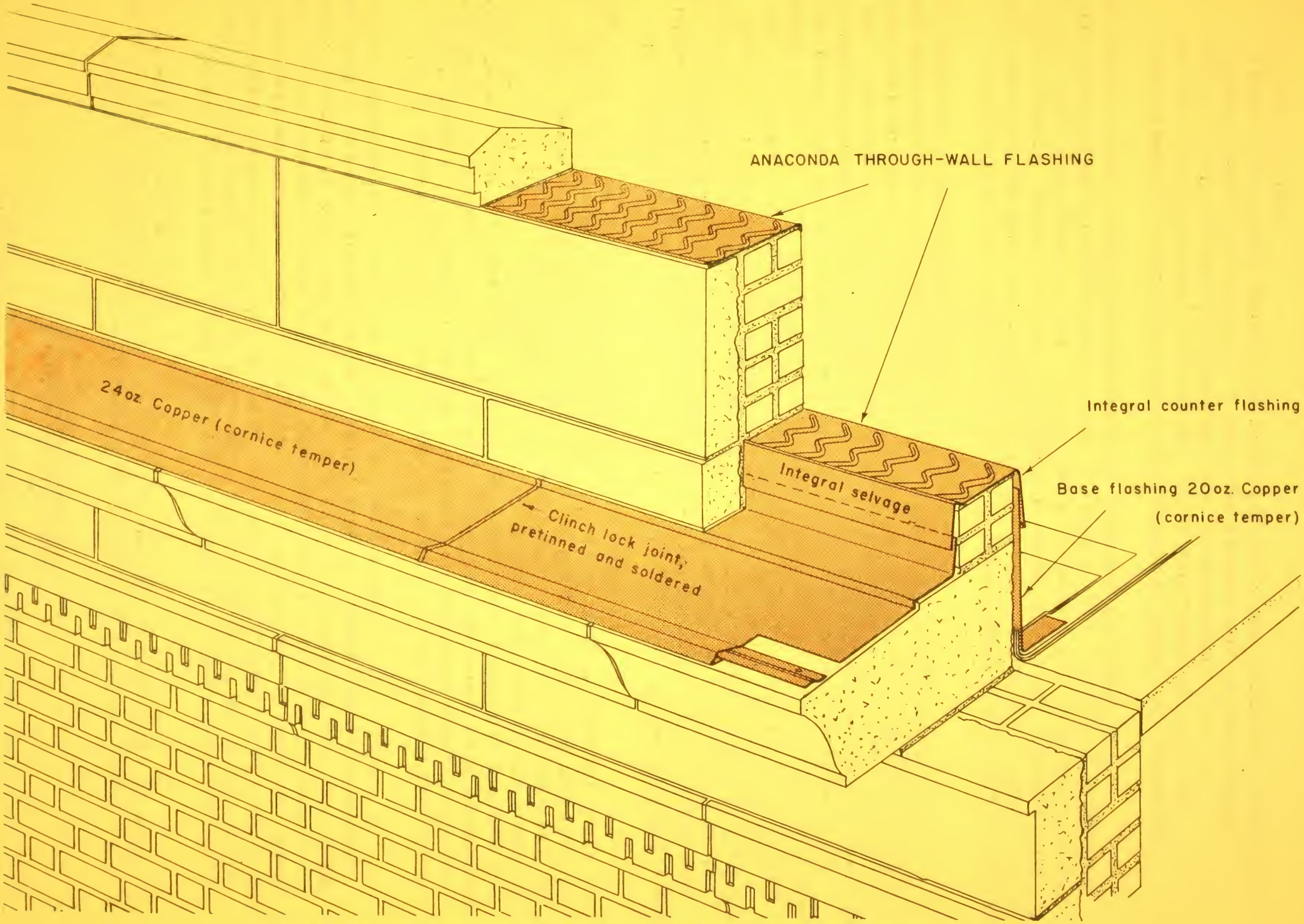
Complete information on the Anaconda Through-Wall Flashing is given in Anaconda Publication C-28.

FLASHING, CORNICE & PARAPET

A.I.A. 12

ANACONDA SHEET COPPER



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

FLASHING, CORNICE AND PARAPET

Anaconda Sheet Copper

Copper flashing has a very important function in masonry construction. In general, masonry materials are very porous and this is especially so with all but the hardest of natural stone.

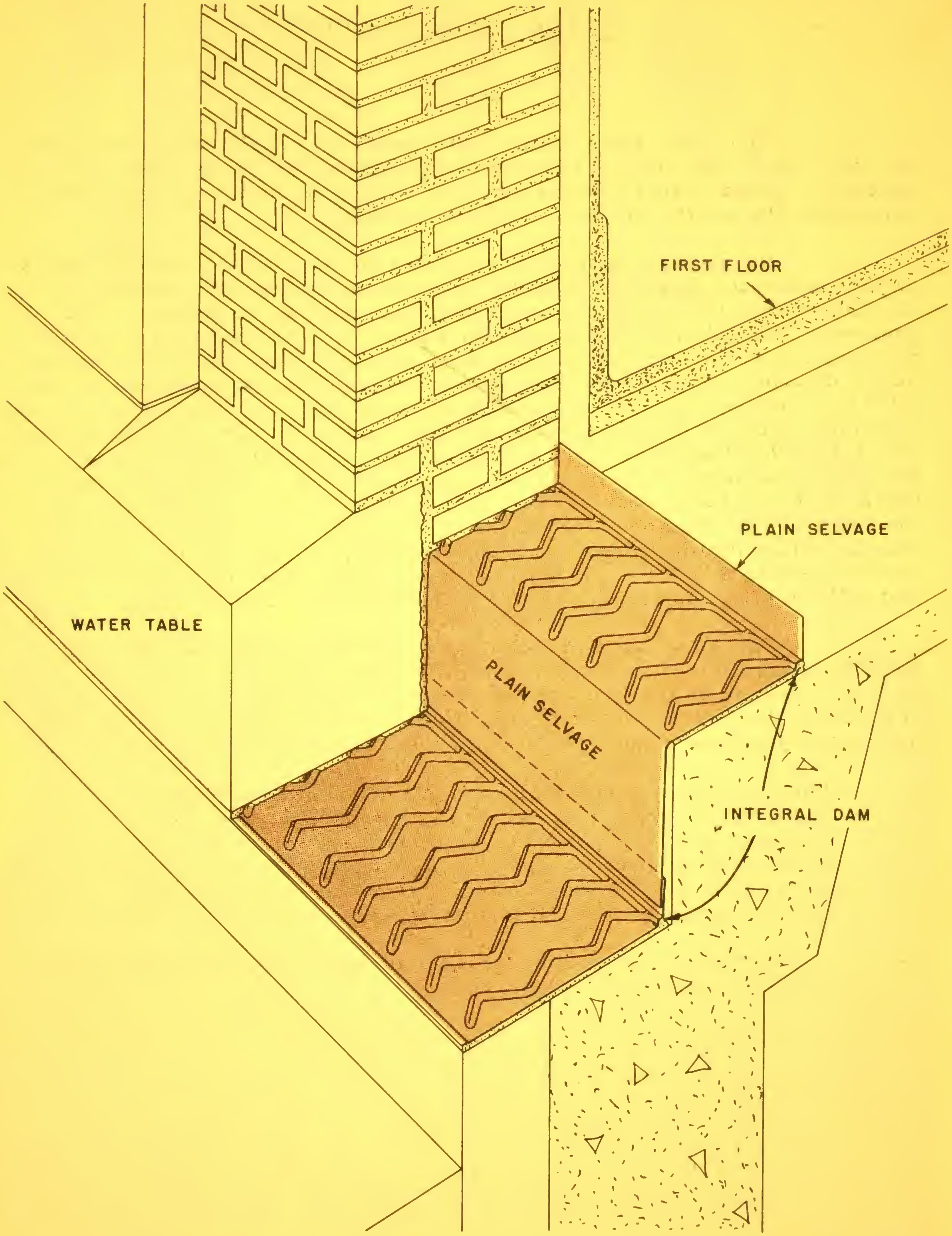
Man-made masonry materials such as artificial stone, brick and terra cotta are all quite porous and absorptive and, after a length of time, will admit and flow water rather freely - the early benefit from the admixture of waterproofing compounds notwithstanding. A common brick may absorb as much as 35% of its own weight in water, while artificial stone and terra cotta are designed for a 15% water absorption to insure suction for a strong bond with the mortar. Even for masonry of granite, limestone or marble, copper flashing is necessary because it is impossible to make vertical joints permanently water-tight.

Water absorption in a masonry wall is of concern in a warm climate because of the danger of damage to the interior. In cold climates there is the additional danger of damage to the construction caused by the freezing of water that may find its way into the masonry. This usually becomes evident in the way of scaling on the face of natural stone and spalling or disintegration of the artificial stone. In brick work this destructive force manifests itself in breaking away parts of the mortar joints and destroying the cohesion of the particles that make up the brick. This is particularly so with common red brick, and, of course, there is a warning in the form of white stains from efflorescence.

If the cornice and parapet are flashed with copper as shown on the accompanying drawing, the face of the building will, in all probability, never require any repair. Anaconda Through-Wall Flashing installed under the coping so that its press formed dam is on the outside edge will divert the absorbed water toward the roof. Even when the mortar joints between the coping stones deteriorate and chink out, the water entering these openings will be drained away by the flashing. The lower course of AnacondaThrough-Wall Flashing protects the structure below from the water that usually saturates a parapet wall during rain because of the double action of pressure and suction caused by the wind on exposed walls above the roof line. Note that the Anaconda flashing can be obtained with a plain selvage on both drain and dam sides. On the drain side the selvage forms a counter flashing over the base flashing and on the dam side this integral selvage serves as a counter flashing to the cornice flashing.

The top surface of a masonry cornice is particularly vulnerable to damage caused by wind-driven rain sweeping along the surface and into the vertical joints. Plain sheet copper, cornice temper, installed as suggested in the drawing will protect the stone and mortar joints. The copper is locked to a continuous cleat which has been fastened to the cornice near the outer edge. Caulking compound is often used to make a tight joint between the cleat and the stone.

ANACONDA THROUGH-WALL FLASHING



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WATER TABLE FLASHING

The water table at the first floor level usually projects beyond the wall line of the building to have the appearance of a heavy base or pedestal. Construction such as that with a more or less level top surface exposed to the weather requires proper flashing.

Usually the flashing is carried from one level to another so as to pass under the stone water table, and also to lie directly beneath the starting course of the masonry wall at the level of the first floor. The Anaconda Through-Wall Flashing with a plain selvage specified on both the dam and the drain side provides an ideal flashing when installed as shown on the drawing. The unevenness that will naturally occur between the two levels is absorbed by the over-lapping vertical flanges of the two pieces of flashing, so that a solid bearing is possible at both levels, and the flashing will set so that the water will positively drain toward the outside. Otherwise, when the flashings are formed of one piece and bent across the corrugations there is always the probability that the vertical section is either too high or too short to run from one level to the other. When it is too high the upper flashing will cant toward the interior, shedding the water in the wrong direction, and if it is too short the heel of the lower flashing will be hollow and will not offer support for the water table and the load above.

The Anaconda Through-Wall Flashing is furnished flat with a specified breadth of corrugation, and with plain selvages, to be brake formed in the shop or on the job. The continuous water table flashing is made up of pieces 8' long, lapping one corrugation endwise. The upstanding edge, as well as the overlap of the two pieces of the flashing is usually made 2 high.

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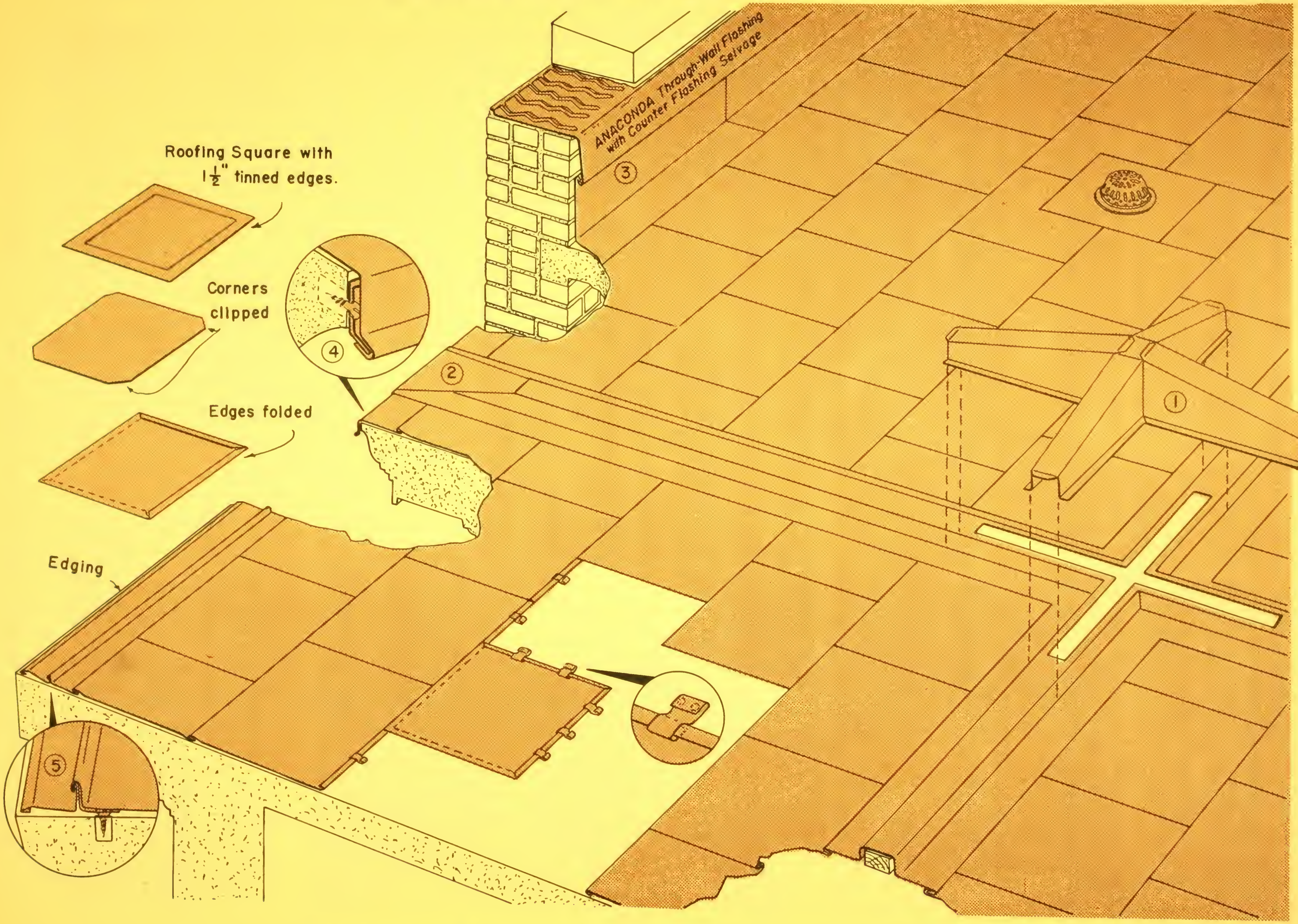
Complete information on the Anaconda Through-Wall Flashing in Anaconda Publication C-28.

ROOFING – FLAT LOCK SOLDERED SEAM

A.I.A. 12

ANACONDA SHEET COPPER



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

ROOFING - FLAT LOCK SOLDERED SEAM

Except for church spires and the steep portions of domes flat seam roofing must necessarily be soldered in order to be weather-tight and water-tight. Unlike other types of copper roofing in which the sheets of copper can expand and contract freely by virtue of weather-tight standing seams or batten seams, this kind of roofing with soldered joints becomes, in effect, a single sheet of copper over the entire roof or roof panel area. Thus, unless metal of proper thickness is used and suitable provision is made to allow for movement, waves or buckles may form in the roofing squares when the metal expands in warm sunny weather. During cold weather the metal becomes stressed due to contraction with the force of contraction becoming increasingly greater from the center of the panel or roof area to the perimeter.

It has been learned from experience that long lasting construction will result if the roof is divided into rectangles about 40' square, thereby creating a number of small roof areas isolated from one another by expansion battens. This drawing suggests such small roof areas surrounded by expansion battens with expansible intersections, (1) so designed that all the copper can shorten a reasonable amount in cold weather without excessively stressing the metal. For roofs that are to be sprayed or flooded all joints must be soldered, but intersections of expansion battens at a ridge or at the crown of a vaulted roof can be capped with a sliding cover without solder.

At the edge of the roof or at vertical extensions at parapet walls the battens can be beveled on the top surface and folded without cutting the metal, in a manner as shown on the drawing (2). Where the flat seam roofing adjoins a wall it is finished with a base flashing of copper with soldered seams extending up behind a loose counter flashing in the usual way (3). Where the roof extends over a cornice it can be finished with an edging strip forming a drip edge at the corona as shown (4). For an overhang or sunshade, as in contemporary design the roofing can finish at a point slightly back from the edge, with a canted edging strip (5). The standing seam which provides anchorage and a support for the edging is located back far enough as not to visibly form the ground.

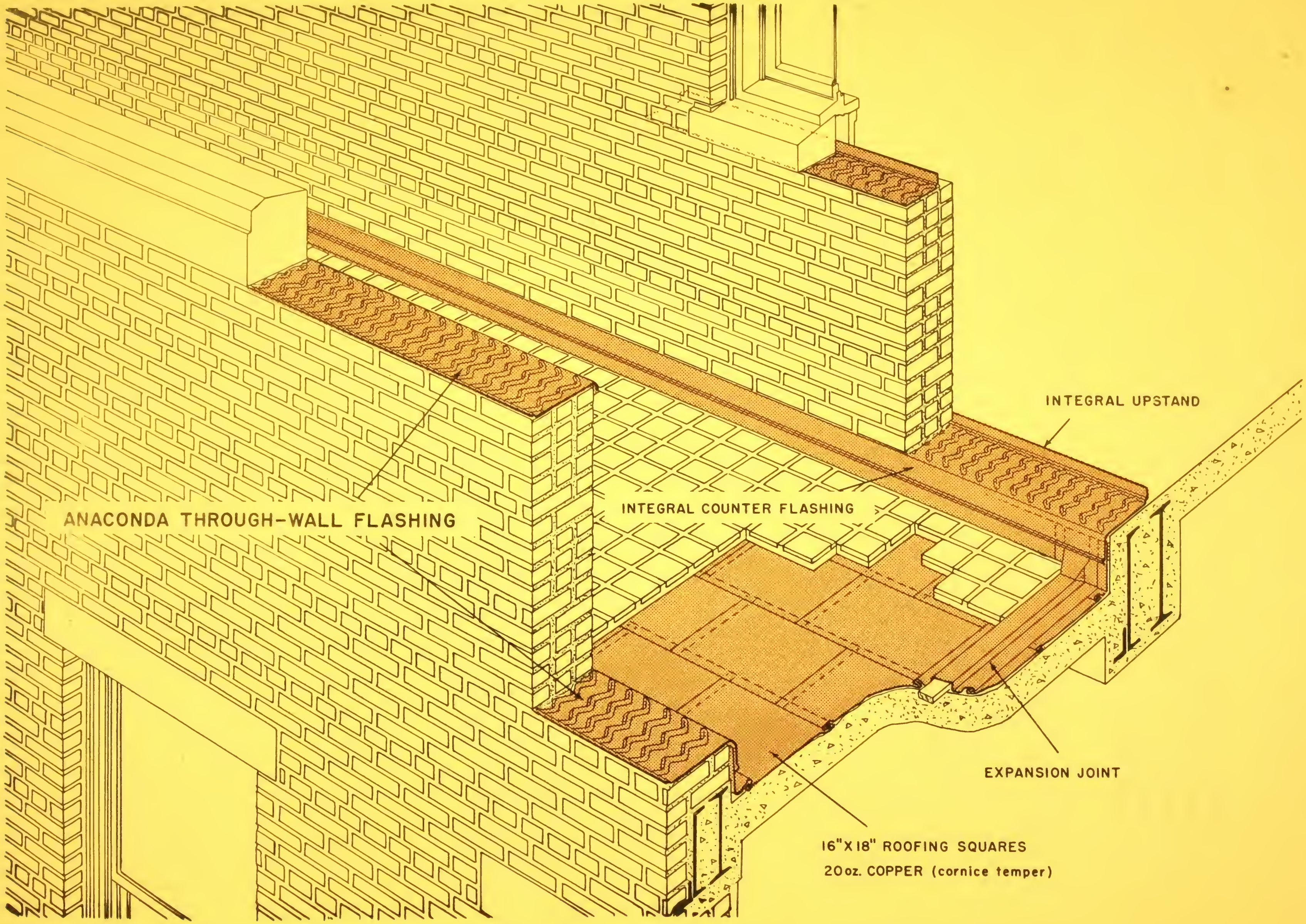
For flat lock soldered seam roofing, as well as for all other soldered work the copper must be of cornice temper, and of suitable gauge. The roofing squares should be of 20 oz. copper of cornice temper, measuring preferably 16" x 18". 16 oz. cornice temper copper could be used, but the squares would need to be considerably smaller in order to obtain the same resistance to uplift in time of wind and storm. The smaller squares would have a much greater length of soldered seam per square of roof, with the result that the additional labor involved would make the cost as high as that for roofs of 20 oz. copper. The choice is simple; the heavier copper will benefit both the building and the owner.

The expansion battens, the edging strips and the base flashing should likewise be of 20 oz. copper of cornice temper. Generally, all joints are to be pretinned, clinch locked 3/4" and soldered with regular 50/50 solder, the work to be washed and rinsed immediately after soldering.

FLASHING – PROMENADE DECK, BUILDING SETBACK

A.I.A. 12

ANACONDA SHEET COPPER



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DING SETBACK

Setbacks, or the stepping back of outer walls of tall city buildings is generally required by law to admit light to the lower stories and to the street below. Setbacks are also used as a part of the architectural design. The roof for a setback can be located at any practical level in respect to the top of the coping on the outer wall. Some architects design only for a serviceable and easily accessible gutter near the top of the coping for drainage. Others prefer a parapet wall and promenade deck for an outdoor walk, for horticultural decoration and for the safety of workmen who are to maintain the roof deck, to point mortar joints, and to caulk windows and copings, also for the protection of window cleaners, painters, etc. With such a promenade deck the occupants of the building can get out into the air or the sunlight, and possibly to witness a spectacle in the sky, or a notable event or celebration in the streets below.

The roof covering at the setback should be of the best and the most durable kind because of the great difficulty, inconvenience and expense that would be involved in renewing the roof in such a location. For that requirement copper is probably more suitable than any other material.

This drawing shows a flat lock soldered seam roof of 20 oz. copper of cornice temper over which a wearing surface of promenade tile is laid. The roofing squares of 16" x 18" are shown to be installed in the usual manner with pretinned edges and clinch lock seams, held in place with copper cleats, flattened down and soldered. Water-tight expansion joints in the copper roofing extending across the deck at intervals of not over 40' are intended to divide the total length of the promenade into relatively small isolated areas with a downspout, to carry off rain water, located midway between the expansion joints. The expansion joint, as shown on the drawing, is made up of a strip of wood about 3-5/8" x 1-5/8" in size with a loose fitting copper cover wrapped around the top of the strip of wood. This will allow the slight amount of movement necessary for the copper roofing. The expansion and contraction in the promenade tiling is absorbed by expansion joints of mastic around the outline where the tiling abuts either the vertical walls of masonry or the copper expansion joints.

The drawing also shows proper flashing for a promenade deck which in this case consists of the standard Anaconda Through-Wall Flashing with 12-1/4" corrugation and integral selvage of plain copper on the drain side to serve as a counter flashing for the copper roofing. The regular Anaconda Through-Wall Flashing without selvages is shown under the coping stone to receive and discharge the water that may flow into the vertical joints of the coping, as well as any rain water that might penetrate the coping stones, particularly if they are machine made. There is also a 8-1/4" Anaconda Through-Wall Flashing with a one inch upstand located under the window sill and extending about 6" beyond the jamb. The upstand on the dam side of the flashing at the floor level is optional and depends somewhat upon the severity of exposure or on orientation of the building wall.

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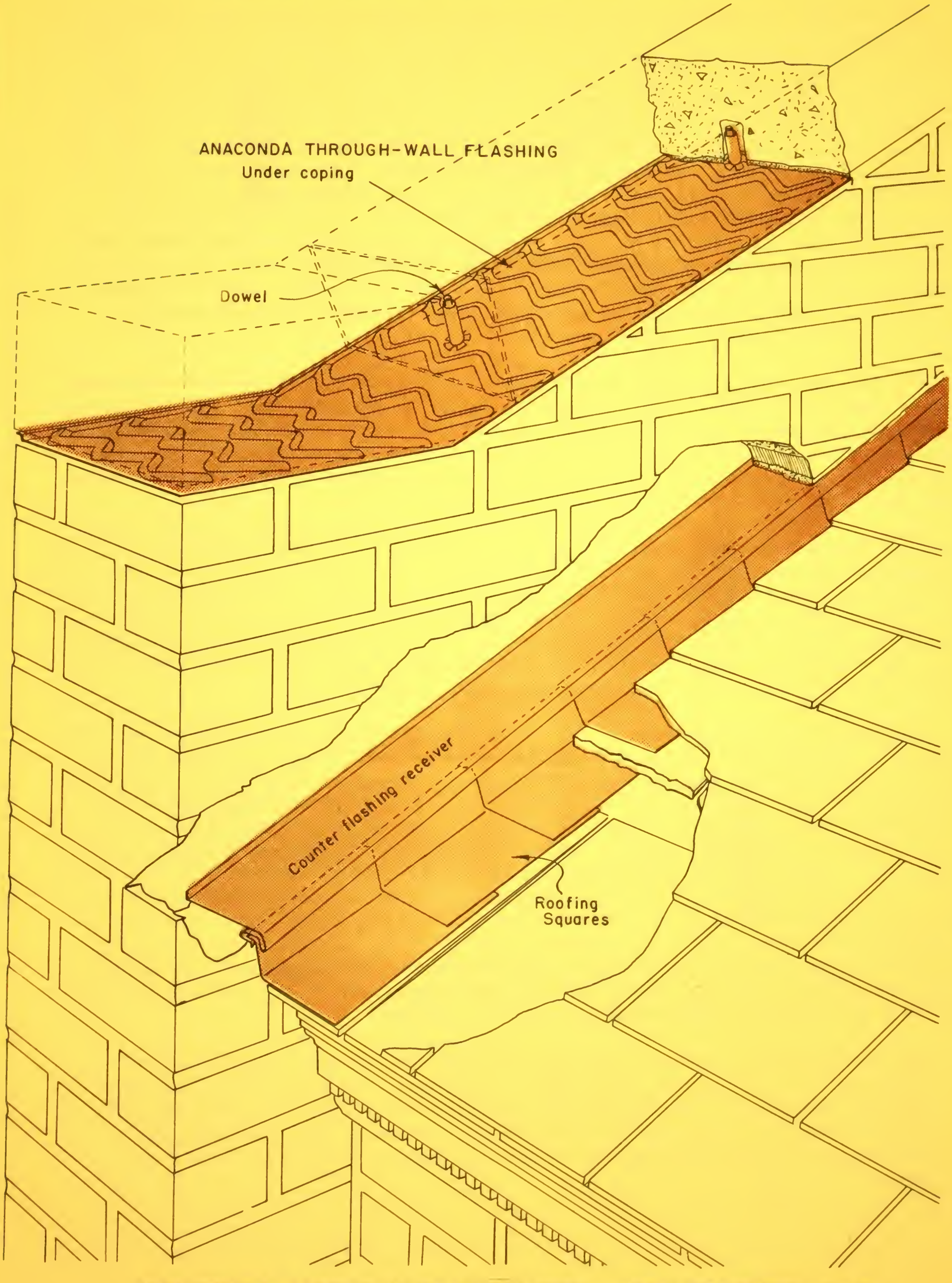


ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

FLASHING—GABLE END PARAPET

A.I.A. 12

GABLE END PARAPET - STRAIGHT LINE COUNTER FLASHING

The matter of flashing to a vertical wall of masonry along the slope of a steep roof has always been somewhat of a problem to the architect and the builder. If the wall is of brick it is common practice to step the counter flashing so as to conform to the rectangular lines and dimensions of the courses of brick, to get a strong wall and to avoid cutting the brick. Work of that kind that is well done will serve its purpose indefinitely so far as protection against the weather is concerned, provided there is through-wall flashing at reasonable intervals. However, the step type of counter flashing has certain undesirable features. From a practical standpoint an installation of step flashing may easily develop into an unhappy result through insufficient care in laying out and doing the work. On a very steep roof the drop ears of the counter flashing become long and pointed and it is extremely difficult to avoid unpleasant shadow lines at the vertical laps and at the exposed edges of the flashing where it lies against the brickwork. If tack soldering is resorted to, as is often the case, the condition is aggravated because the sheet metal becomes bowed from elongation in hot weather.

For the streamline effect that is typical of modern architecture a straight line counter flashing parellel to the rake of the roof is very desirable. The bricks need only to be cut to the line of the flashing which is quite simple particularly with common face brick. These bricks can be trimmed to a reasonably straight line with a brick set, and finished by rubbing with a carborundum brick. Hard burned face brick can be molded or machine cut to the proper bevel.

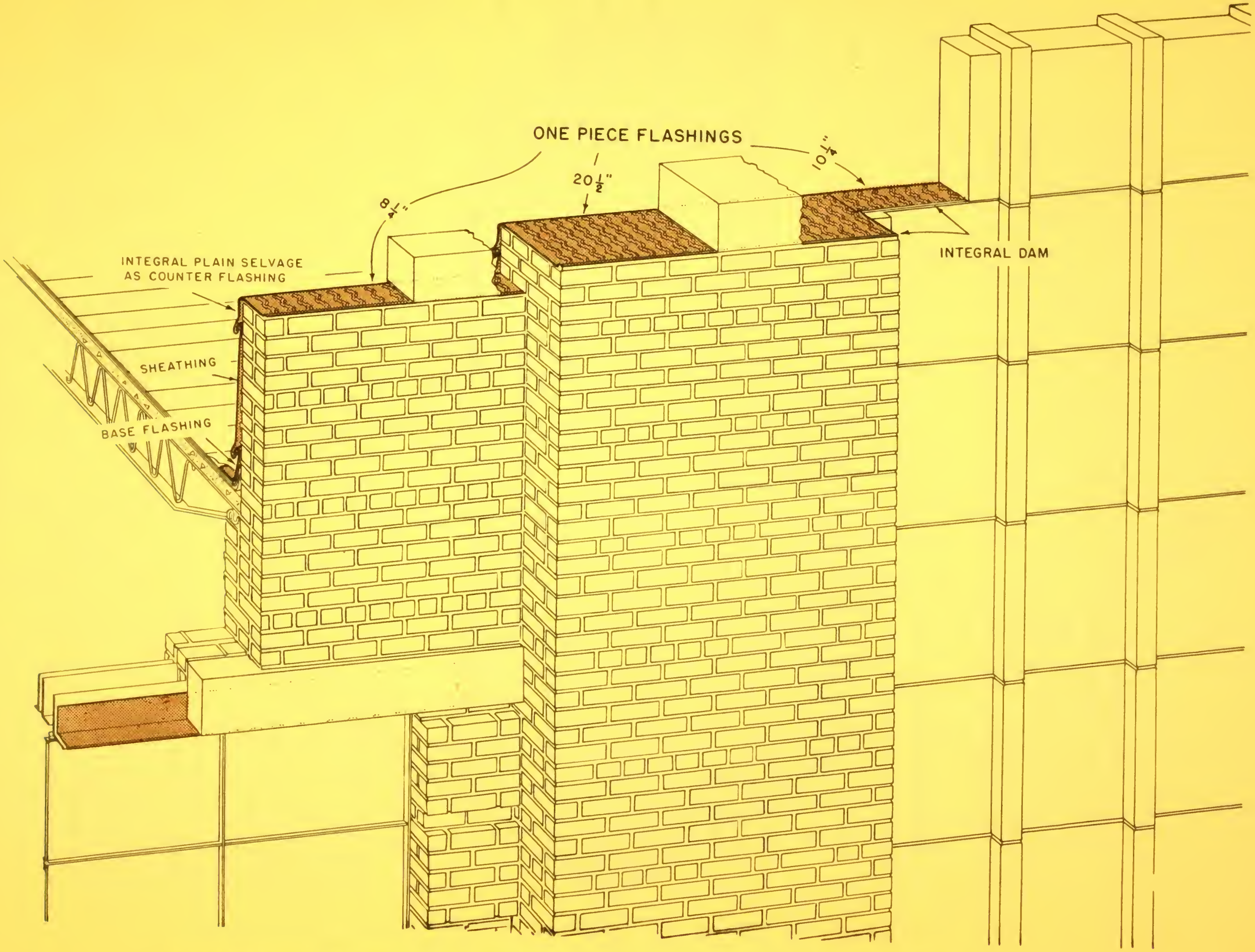
This drawing shows the flashing of a steep roof at a gable end wall. There are individual flashing squares for the successive courses of shingles with a counter flashing having a weatherproof base flashing receiver feature, and extending 4" into the wall. The roof and wall flashing is made additionally safe by Anaconda Through-Wall Flashing installed under the parapet coping. By means of these flashings any seepage of rain water is intercepted and diverted to the roof side of the wall where it can flow onto the roof and drain away outside the building.

The flashing squares which are woven into the courses of shingles should be 7" long for shingles that are laid 5" to the weather, allowing a 2" head lap for the flashing. The width of the flashing should be whatever is required for building into the shingles from 3" - 4" and to reach vertically and horizontally into the 4" counter flashing receiver. The counter flashing is shown to extend into the wall with a 1/2" upturn on the inner edge. This flashing is installed in 8' lengths with an end lap of 3". The through-wall flashing under the coping stones is also 8' long, lapping 3" or one corrugation. The flashing and the coping stones are held in place by means of dowels made of 1/2" brass rod or 3/4" heavy wall copper tubing passing through the flashing, reaching 2" above, and 6" down into the masonry. The holes in the through-wall flashing made to accommodate the dowels are rendered water-tight by means of copper sleeves over the dowels which are soldered to the flashing. All the copper for flashing is of 16 oz. gauge.

FLASHING – WIDE COPING

A.I.A. 12

ANACONDA THROUGH-WALL FLASHING



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

THROUGH-WALL FLASHING FOR GOOD CONSTRUCTION AND TO AVOID STAINING BY EFFLORESCENCE

That walls of common brick are extremely porous and absorptive can not be proved more clearly than by the efflorescence that appears on the surface of such walls, usually in the spring of the year. The efflorescence which forms a white stain on the face of the bricks is the result of a chemical action between the iron oxide of the bricks and the lime sulphate of the mortar, producing a froth which upon saturation of the masonry by rain water, flows to the outer surfaces where it becomes deposited in the form of mineral salts due to evaporation of the water and exposure to the air. There are other explanations for this peculiarity in brickwork which account for efflorescence by the presence of carbonate of soda. This is popularly referred to by many of the old school as "saltpeter." If the brickwork is kept reasonably dry the efflorescence will not appear. Therefore, unless the walls become saturated, and if they can dry between rains as in summer, there is no staining. Only in winter when the walls are cold and never dry out entirely, and if they are not protected with proper flashing, do the ugly splotches of efflorescence disfigure the building.

One of the great difficulties in the maintenance of masonry buildings is that of making the vertical joints between coping stones water-tight. No matter what is done hairline cracks will eventually develop, and the rain water will feed into the cracks by wind driven rain and capillarity. Then there is the porosity of artificial stone which with wide copings as on pilasters or buttress caps permit a great deal of rain water to soak through to the masonry below. A simple and inexpensive protection against such an eventuality is to use through-wall flashing under all copings and possibly at the counter flashing level.

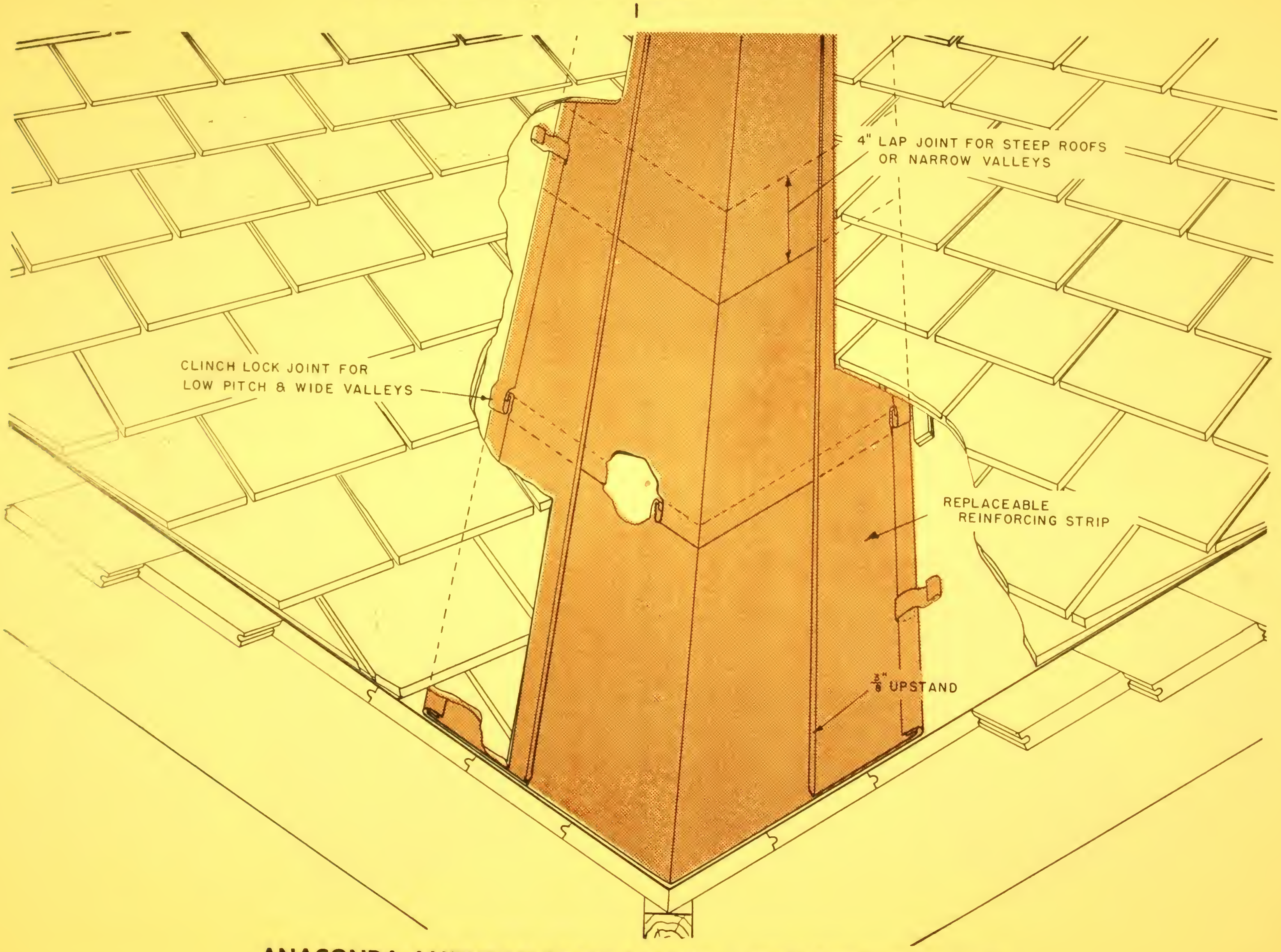
This drawing shows a detail of construction with Anaconda Through-Wall Flashing under the coping. It makes use of the varied widths of corrugation which are easily available in increments of 2" ranging from 8-1/4" to 36-1/4". In this case the flashings have corrugations 8-1/4", 10-1/4" and 20-1/4" wide. This Anaconda flashing with an integral dam will positively divert any rain water seepage toward the roof where it will discharge over an integral counter flashing of plain copper. In that way the water that would otherwise produce unsightly efflorescence is carried harmlessly away and delivered to the roof where in time it goes down the drain pipe.

This drawing is submitted only as a suggested method of application or use of our Company's products. Since our Company does not supervise or control the installation of, workmanship upon, or ultimate use of its products, it does not assume any responsibility regarding the same beyond that provided for in the Company's published Terms of Sales.

FLASHING – VALLEY, WITH REPLACEABLE REINFORCING STRIP

A.I.A. 12

ANACONDA SHEET COPPER



PROTECTION AGAINST LINE CORROSION

The presence of sulphur in fuels burned in and around metropolitan areas forms large amounts of sulphur dioxide, which dissolves in atmospheric moisture and is oxidized by the air to form dilute sulphuric acid. When this acid, borne by fog, dew or rain, settles on a copper roof, it reacts with the copper and yields basic copper sulphate. Because this salt is sparingly soluble and adherent it acts as a protective film to inhibit further corrosion. This is extremely slight because it is spread over a large area and the moisture loses its corrosiveness by reacting with the copper.

On the other hand, this acid moisture is not neutralized if it falls on an inert roofing material, such as tile, slate, wood, asphalt or skylight glass. The run-off from a large inert area may be concentrated on a relatively small area of copper such as a valley or gutter. There is no opportunity for the protective coating of basic copper sulphate to form and under severe conditions fairly rapid corrosion of the copper may occur. That condition has been found to be most pronounced at the edge line of the shingles in valleys, and at the drip line in gutters. For this reason, it is called line corrosion. This chemical action is accelerated in valleys where the edges of shingles are not raised, but are allowed to rest on the copper, in which case, they will retain a bead of the corrosive water due to capillarity, thus allowing a greater length of time for attack.

It is fair to say that in the great majority of cases where copper is used this effect is negligible. There are, however, some places where line corrosion presents a real problem, particularly in manufacturing centers along the seacoast.

This drawing suggests the insertion of a strip of copper with an upturned bottom on top of the copper valley lining so located at the edge line of the shingles that, if line corrosion should take place, the main copper valley lining would not be affected. For renewing the protective reinforcing strip, a new strip with a 3/8"upstand and a 4" leg can be slipped into place and made fast by clinching with the upturned edge of the original reinforcing strip. Copper valley linings are usually of 16 oz. or 20 oz. cold rolled copper. The reinforcing strips should be of the same gauge.

ROOF-BATTEN SEAM

A.I.A. 12

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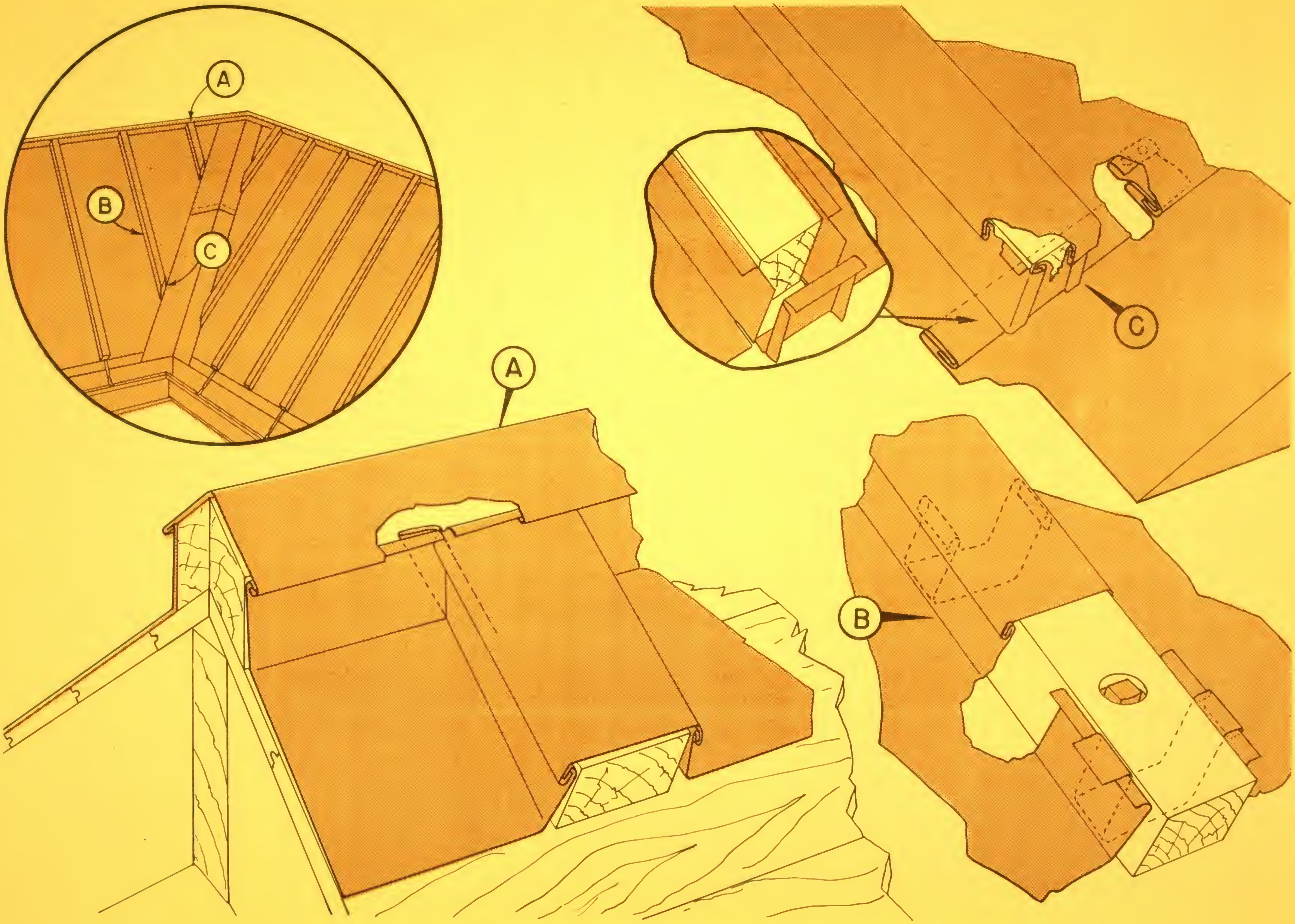


ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

ROOFING - BATTEN SEAM

The batten seam method is the most popular type of copper roofing, and is commonly used for monumental buildings, and on structures that are designed to remain a long time. With this type of roof the main object is to provide a weather-tight construction without the use of solder, and to enhance the beauty of the building by a proper proportion and spacing of the battens. For cold climates where there is an abundance of snow, it has been found quite practical to build roofs that are steep so as to shed the snow, and to avoid heavy roof loads, as well as back-up troubles that are likely to develop with low pitch roofs and wide overhangs. In this case, as evidenced by the exemplary copper roofing in Canada, 2" x 1" battens are very effective, both in construction and in architectural appearance. For a more moderate climate where roofs are not so steep there is likelihood of occasional deep slush or thin crusts of ice or snow which sometimes causes slight damming up of water due to the irregular flow down the roof surface. For such a condition battens are usually made larger and deeper on the order of 3" x 2".

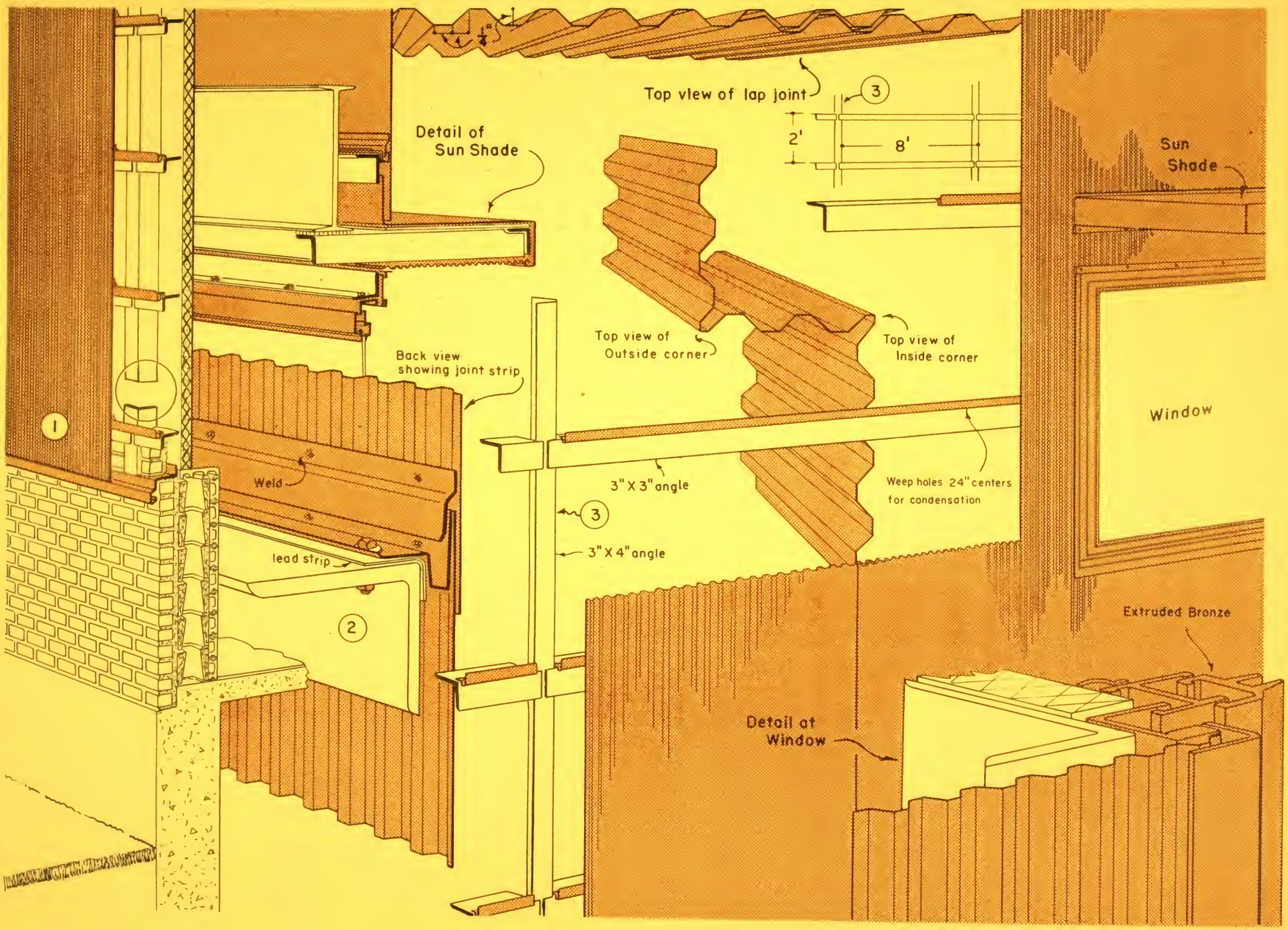
This drawing shows a rectangular batten with the copper roof pans laid loosely between the battens allowing a 1/16" clearance on each side between the base of the pan and the batten. In making the cross joints the leading edge of the pan in place is raised above the top of the batten, the sides flared outward so that the successive pans with the bottom edge also flared, can be interlocked and the two worked back into place with a broad faced tool that is used for the purpose. The cross joints are ordinarily left dry, without solder, and closed lightly with a block of wood and mallet. For slopes that are less than 4" per ft. the cross joints should be filled with white lead paste or a suitable caulking compound before malleting. Blind soldering may be resorted to, but in that case the copper must be cold rolled to what is known to the trade as cornice temper.

For best appearance, batten seam roofing employs sheets of copper that are 24" wide x 96" long, usually of 16 oz. gauge. Joints are ordinarily of the simple single lock type with a 3/4" clinch lock. The copper of the roof is never fastened directly, but is always held in place with copper cleats to allow the covering to adapt itself to changing temperatures and other conditions about the roof. Where the roofing on the slopes adjoins the valley, or at the eave where there might be an apron, either a part of, or separate from the gutter extra protection may be had by forming a clinch lock with a 1-1/2" turn back on the underlying sheet and a 3/4" reverse bend at the bottom edge of the overlying sheet, as shown in detail. Where the roof pans adjoin the ridge cap the corners are folded in the manner as shown which does not require cutting or solder.

CURTAIN WALL—METAL

A.I.A. 12

ANACONDA SHEET COPPER



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CURTAIN WALLS OF METAL

Improvement in building construction has reached the point where year-round comfort conditioning is available and will probably become standard in buildings of the future. Too, there is increasing concern and serious thought given to the long term economy of certain building materials and types of construction. All this has come about through scientific progress and through the high cost of building maintenance.

The economics of comfort conditioning depends largely upon insulation and on the type of enclosure, though the cost of equipment and operation is an important factor. An examination of conventional construction with brick or stone soon shows that these materials, having the highest heat loss and heat gain characteristics of all common building materials and with a high rate of water absorption and vapor penetration, are engineeringwise ill suited as an enclosure for buildings with modern equipment.

The present requirements of an exterior wall are that it shall be insulated so as to keep the heat transmission both inward and outward at a minimum. Then there is to be an exterior surface or covering that will be durable and preferably impervious to water and vapor. The walls must be ventilated to render harmless the condensing of vapor from inside the building in cold weather, and to prevent the penetration of heat from the outer surface of the building to the insulated wall in hot weather. In addition, the exterior wall must have color for architectural design.

This drawing shows an exterior wall with metal facing. The wall consists of large sheets of metal reaching from floor to floor with vertical striations of a fine trough and reed type corrugation (1). The sheets are stiffened with horizontal joint strips, spot welded to the reverse side at 24" intervals vertically. Those joint strips engage a companion strip which forms a continuous support and condensation gutter. The horizontal joints occur at the 2' vertical spacings where the separate supporting members are fastened to light structural framing. The framing may be tubular, rectangular, or in the form of structural angles as shown on the drawing (2). These horizontal girts or walers are in turn supported by a light steel framing which is attached to the structural frame of the building (3). The space equal to the depth of the walers is allowed for ventilation. An insulating wall of suitable materials can be erected against the back of the light framing.

One of the most desirable metals for the exterior is cold rolled sheet copper. Some architects would probably prefer hot rolled Everdur (a copper silicon alloy) because of its pleasing gold bronze natural color. A favorable feature about this construction is that it is equally good for all metals, and offers the advantage of a two-tone effect, if so desired, or a combination of the various metals for contrast in color. Then too an assortment of metals could be chosen for the different parts of a building, according to their architectural importance in the design.

The construction gives the architect the plain wall surface that is characteristic of conventional design. He has a choice of lacquered copper or bronze in the natural new color of the metal, as well as the russet brown and statuary bronze of the metal upon exposure to the weather, or he may have the copper with an artificial patina, either speckled or plain, preliminary to the natural patina that forms on copper after a number of years. Even if the curtain wall is to be painted for architectural effect, the use of a non-rusting metal is wise for it is known that the life of high grade outdoor paint is directly proportional to the rust resisting quality of the underlying metal.

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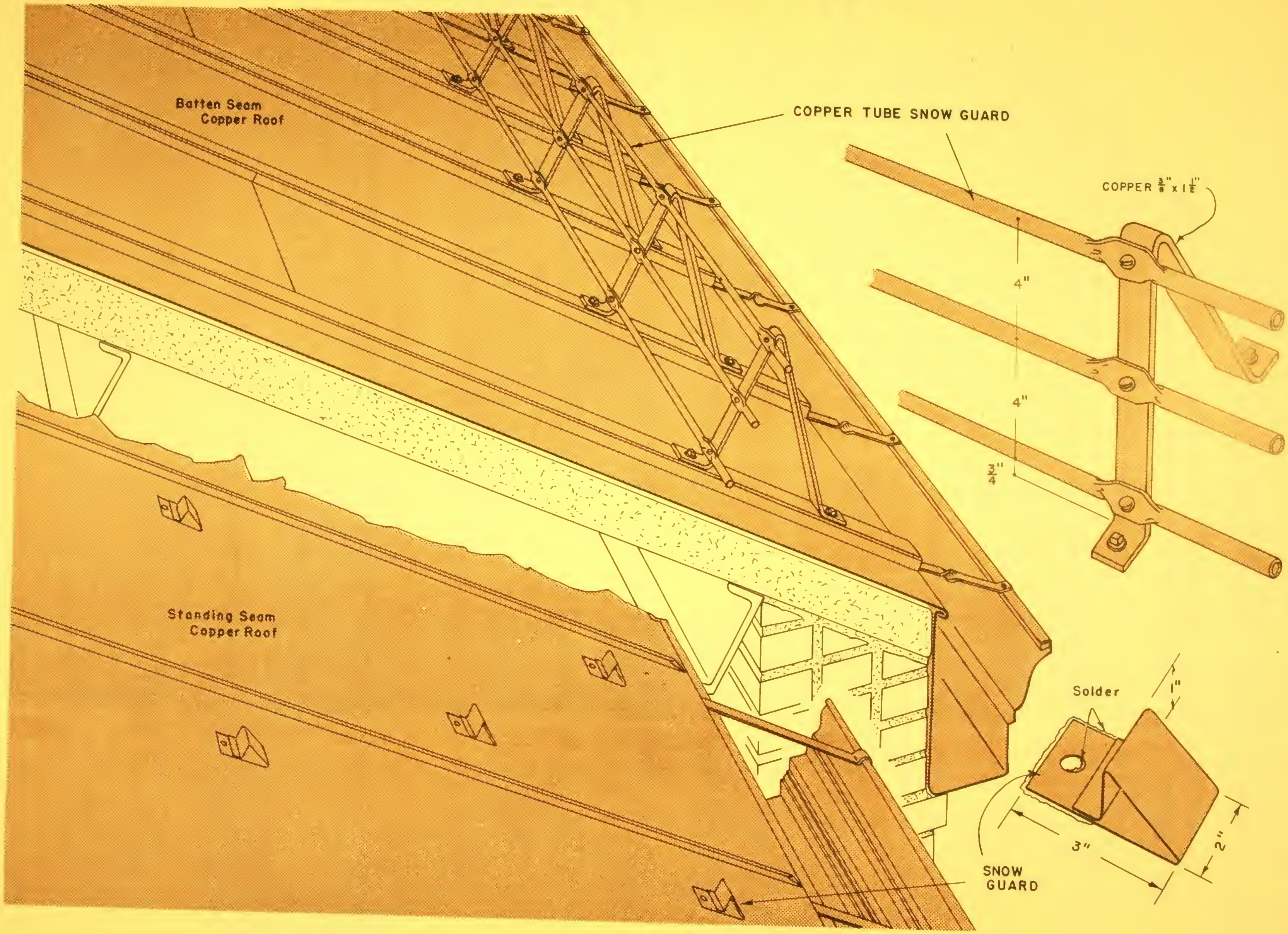


SNOW GUARDS

In cold climates where there is snow there is always a danger of damage to buildings and injury to persons from the downrush of sliding snow from steep roofs. It has, therefore, become regular practice to provide snow guards on the parts of the roof where the snow might fall on a sidewalk, in a court, on a skylight, or in front of an entrance. Snow guards may be desirable on all slopes because of the danger of expensive damage to gutters and the blocking of gutters with snow, resulting in water backing up under the roofing, and the formation of large icicles at the edge of the gutters.

There is a difference in the type of snow guards for the varied climates. In cold winter climates where there is an abundance of snow, architects instinctively design their roofs with considerable pitch since they have found by experience that most of the time the snowflakes do not hold on a steep roof. There is, of course, an occasional snowfall of wet snow which clings to any roofing material and produces a hazard. For such a situation the snow guard must be of the railing type which can withstand the impact of heavy clumps of snow that might come sliding down a long slope in a steep roof.

For roofs in climates with moderately cold weather where the snowfall is lighter and excessive snow loads are not to be feared, architects have designed the roofs with a lesser pitch for reasons of economy. In those climates where the snow is ordinarily only a few inches deep it is likely to become more or less slushy before it disappears from the roof. During cold nights this heavy snow may freeze into crusts or cakes of ice, which when loosened by the heat of the sun may slide off the roof and do serious harm. To avoid such a possibility small copper cleats can be soldered to the copper roof pans in staggered arrangement as shown on the drawing.

The cleat type of snow guard is intended to keep a uniform snow cover on the roof, holding it there until it melts, or turns to vapor. These cleats or snow guards usually occupy the lower portion of the roof extending from one-third to three-quarters the way up the slope so that the snow at the high part of the roof will not have time to gather enough momentum to push past the cleats. The cleats as shown are made of cold rolled 16 oz. copper folded and soldered for stiffness, the top half of the cleat being soldered to the roof pans. The hole in the top flange is to insure a strong solder connection.

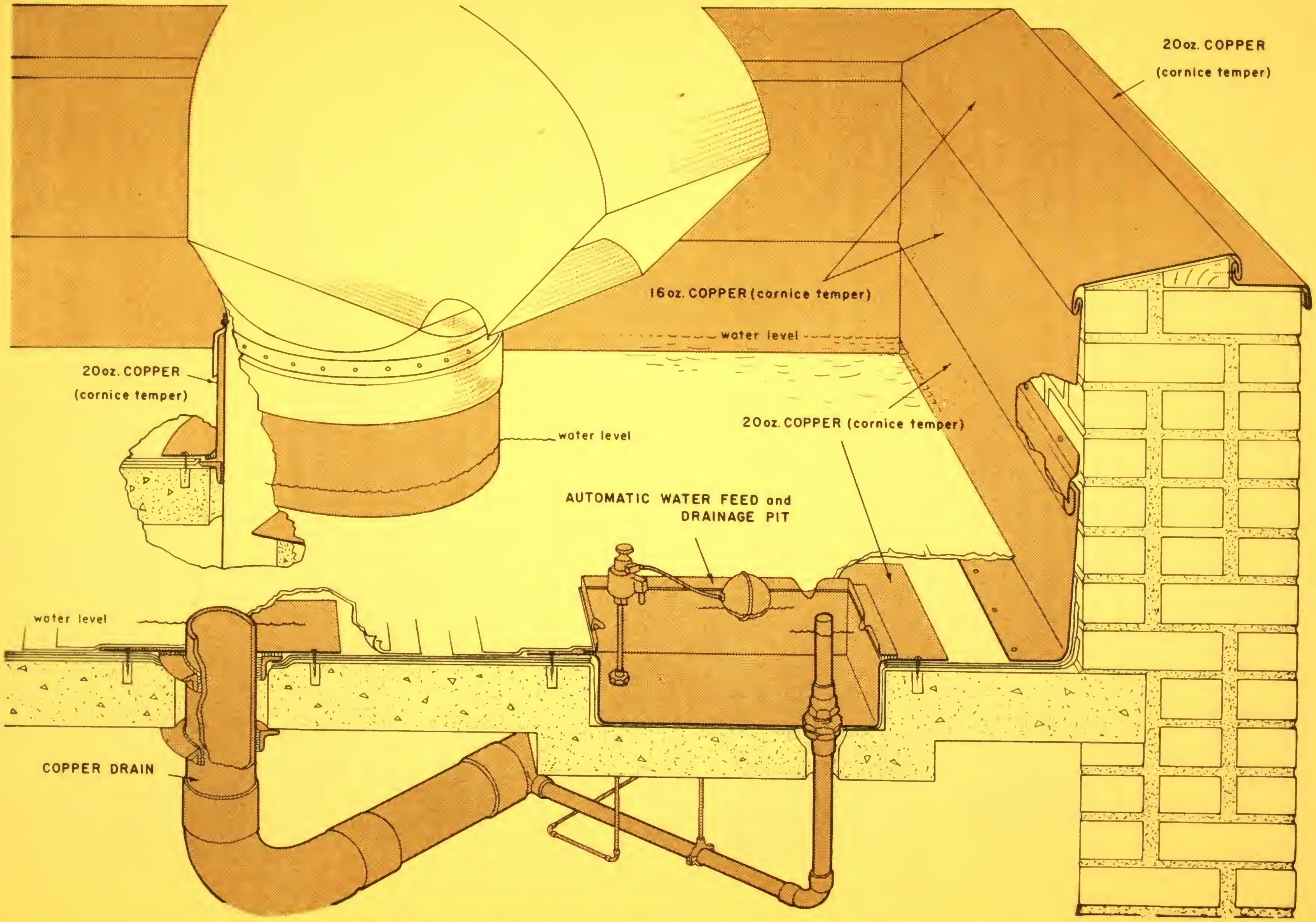
The railing type snow guard is ideal for batten seam roofs because it can be mounted high and dry on top of the battens. This style of snow guard is generally made of 3/4" type "K" copper tube with brackets made of 3/8" x 1-1/2" copper bar stock. The tubes are flattened at the brackets to make an easy connection with 1/4" copper stove bolts. The brackets are screwed down through the copper batten covering into the battens with 3/8" x 2" copper or bronze lag screws. The brackets should be set in white lead paste and the lag screws drawn tight against lead washers. Brackets may be placed on every batten, as shown, for severe winter conditions, or at alternate battens and possibly with only two horizontal rails for conditions that are less extreme.

In cold climates it is always good practice to thoroughly insulate the attic below the eave line or under the roof to minimize backing-up trouble.

FLASHING – FLOODED BUILT-UP ROOF

A.I.A. 12

ANACONDA SHEET COPPER



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FLASHING - SPRAYED OR FLOODED BUILT-UP ROOF

A flooded roof should have copper flashing at all downspouts, at the collar or curbs of ventilators, and at other parts of the construction extending through or above the roof. There should be a sump with provision for high water overflow and complete drainage, also an automatic water feed. The sump should be lined and flashed to the roof, all with copper. Column stubs, or bases for the framework of advertising signs and the like should be encased and flashed with copper. If the framing is connected to the structure below the roof, pitch pockets of copper with upstanding edges and proper flashing may be resorted to. Because of continual dampness of a flooded roof, and possibly wind tossed spray, the roof side of the parapet should be sheathed with copper above a regular copper base flashing, and the coping should likewise be of copper for permanent and trouble-free construction.

The flashing for the downspout at the roof is usually of 16 oz. copper and measures about 14 inches square. This is soldered to the horizontal flange of the pipe collar and flashed or leafed into the built-up roofing. The automatic water feed and drainage pit, as shown on the drawing, made of 20 oz. copper of cornice temper should be built to size and assembled in the shop. The curb or gravel stop at the sump is shown to have a deformation on each side resembling a notch to permit total drainage. The joints in the copper work of the sump should be made extra strong and secure. This can best be done by cleaning the metal with steel wool, pretinning and then making a clinch lock seam properly fluxed and filled with hot solder.

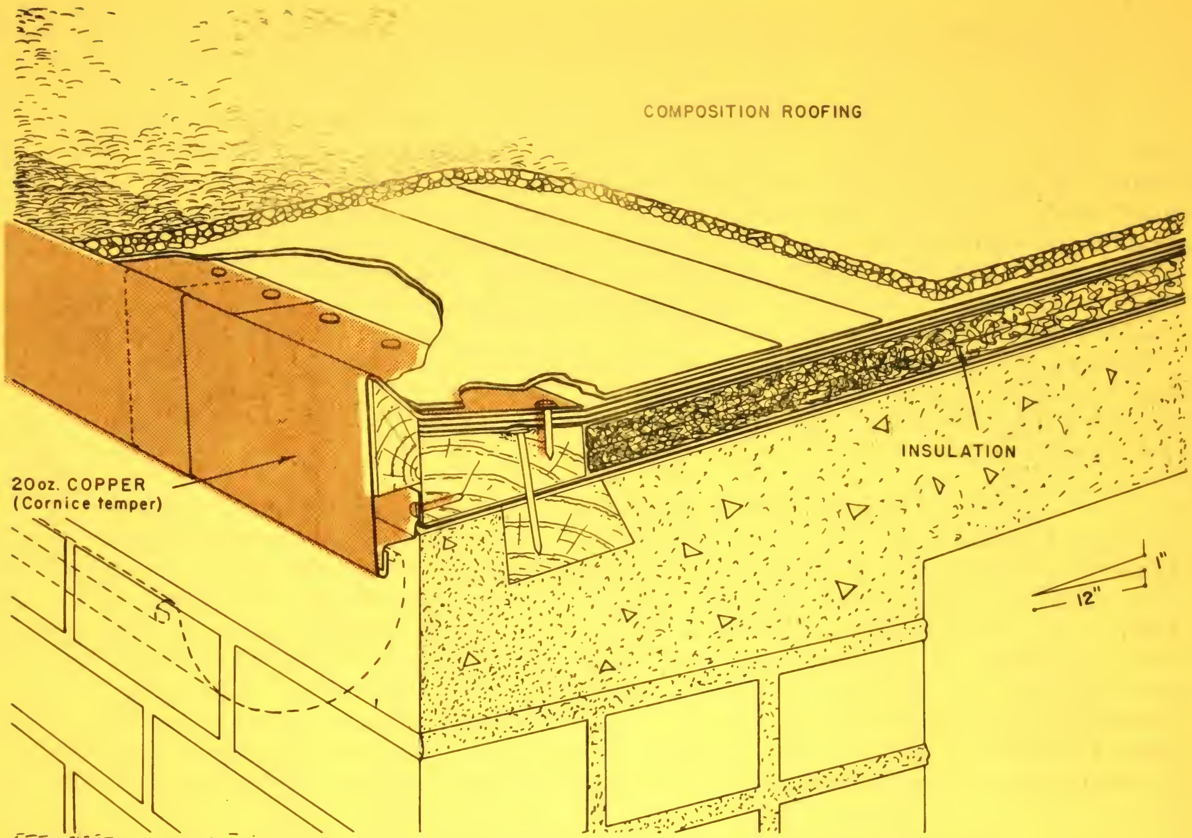
Flashing for vent ducts or other pipes extending through the roof should produce an effect of base flashing and counter flashing, the base flashing extending at least 8 inches above the roof, and to be made of 20 oz. copper of cornice temper. A circular base flashing of the type shown on the drawing should be made of 2 pieces consisting of a flat circular flange at the bottom and an upstanding collar. The joint between the two is lapped or double seamed, depending on size, and soldered on the back.

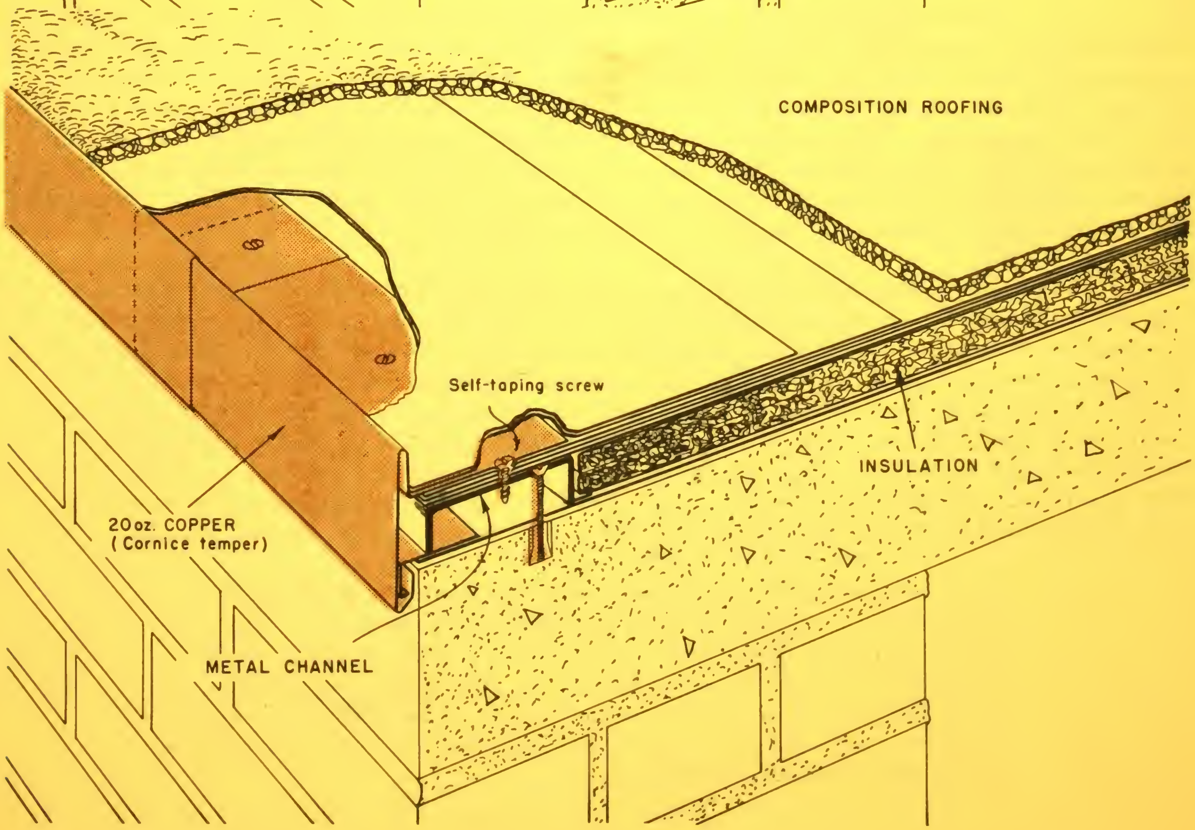
At the parapet wall surrounding a sprayed or flooded roof, it is wise to sheath the roof side entirely with copper. This includes a standard base flashing with a 4 inch horizontal flange built into the plies of composition roofing and with an upstanding leg at least 8 inches high, but not over 12 inches. The horizontal leg being fastened solidly to the roof deck with nails or screws. The parapet sheathing can serve as the counter flashing, as shown on the drawing. The coping is of the receded type with an outer architectural edge of heavy copper, compact in itself, with right angle bends to impart stiffness and to produce a positively straight and trim skyline at the top of the wall.

In this type of parapet construction the base flashing should be 20 oz. copper of cornice temper. The parapet sheathing can be of 16 oz. copper, cold rolled preferred for good appearance, with dry clinch locked joints. The roof of the coping can be of 16 oz. copper of cornice temper with properly prepared clinch locked and soldered cross joints and with expansion joints every 24 feet in the length of coping. The architectural edge of the coping should be made of 24 oz. copper of cornice temper furnished in strips 8 feet long with the ends cleaned and the concealed portions pretinned, the pieces being joined endwise by lapping and blind soldering.

ANACONDA SHEET COPPER

EDGING—INSULATED BUILT UP ROOF





COPPER EDGINGS FOR INSULATED BUILT-UP ROOFS

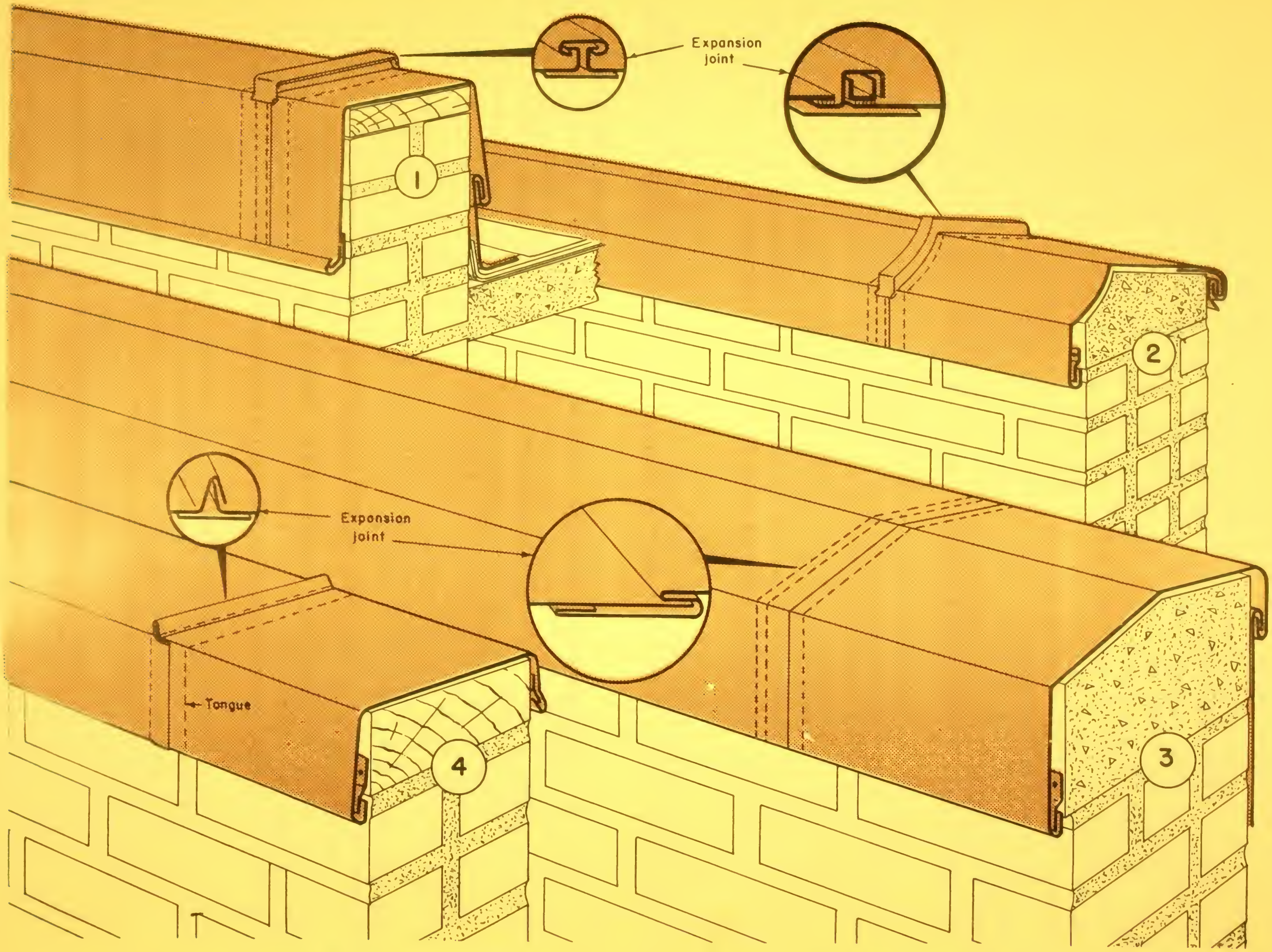
There are certain problems inherent with insulated built-up roof construction which effect metal flashings and edgings. Probably the most difficult is that of assuring a firm and strong fastening for the metal so that it will retain its bond with the bituminous adhesive of the built-up roofing, and that the construction will not be subjected to excessive shear at the margin of the relatively soft cellular insulating material. This drawing shows details of construction for such insulated roofs - one with nailers and sleepers of wood - the other of incombustible material. The sleepers form a hard edging which provides a finish level for the top of the insulation, also a means for nailing the copper edging and flashing and to hold it firmly in position in the built-up roofing so as to prevent movement during changes of temperature.

The drawing with wood nailers shows a type of edging which is canted upward slightly, and which has a gravel stop somewhat higher than the ordinary to prevent the tar and gravel from overflowing the brim and streaking the fascia, or even the side of the building. This type of edging or gravel stop is designed to serve with a hanging gutter in case the rain water is to drain over the edge. The copper edging is nailed through the roofing into wooden screeds at 3 inch intervals. The end joints may be lapped and soldered, or clinch locked and soldered on the roof side and lapped on the exposed outside face, the lower edge engaging a continuous cleat as indicated and locked at the bottom of the fascia.

The drawing with a metal channel for fastening and leveling is intended for fireproof construction. The channel is secured to the roof slab with expansion bolts and in turn the copper flashing and edging is fastened to the webbing of the channel with self-tapping screws or sheet metal screws at 6 inch spacing. The end joints in the copper are made with a 3 inch lap, pretinned and soldered on the roof side, but without solder on the outside face. The bottom edge of the fascia is held in place and brought to alignment by means of a continuous cleat, formed as shown.

All copper for flashings and edgings for built-up composition roofing should be at least 16 oz. gauge, 20 oz. preferred, and cold rolled to what is known to the trade as cornice temper. In order that the joints might be worthy of the material, the copper should be cleaned with steel wool, pretinned, clinch locked and soldered wherever practicable. Where soldered lap joints are specified the lap shall be at least an inch wide re-inforced with rivets, or instead the overlapping pieces can be fastened to the structure by putting nails or screws through both thicknesses of metal. All cleats for holding the copper work in place can be of 16 oz. gauge.

ANACONDA SHEET COPPER



COPINGS

In all maintenance of buildings there is hardly anything more troublesome than copings. With copings of masonry there is the insurmountable difficulty of trying to make joints that will prevent the infiltration of wind driven rain and seepage of water from soaking rains and melting snow. In warm climates the penetration of rain water in that manner is certainly undesirable, but in cold climates it is even worse because serious damage from heaving occurs when the water within the masonry becomes frozen and expands with falling temperature. The use of a durable metal such as copper for flashing and covering copings eliminates much of this trouble. Observing the new concept of copper work, this type of installation can now be done better and with assurance of long lasting protection.

FIGURE #1 - Shows a combination of parapet covering and base flashing, both of copper. For work of that size or scale 20 oz. cold rolled copper should be used for both the base flashing and the coping. The edges of the coping are free to slide without straining the fastenings, and, of course, the base flashing is anchored securely in place to prevent movement in cold weather when the bitumen of the built-up composition roofing becomes brittle, and would be likely to lose its grip on the copper if the base flashing were not fastened solidly to the roof. The cross joints in the coping should be neatly clinch locked and blind soldered. At 24' intervals there should be expansion joints, as shown, in the form of a batten across the top of the coping, and flush clinch joints at the inner and outer faces of the coping. A strip of copper is placed under the joint to serve as a tongue for additional protection. This design of copper coping was used very successfully on a new apartment building in Canada. The outer edge was fastened with an exposed continuous holding cleat which is different from the more common type shown on the other drawings, although not necessarily better.

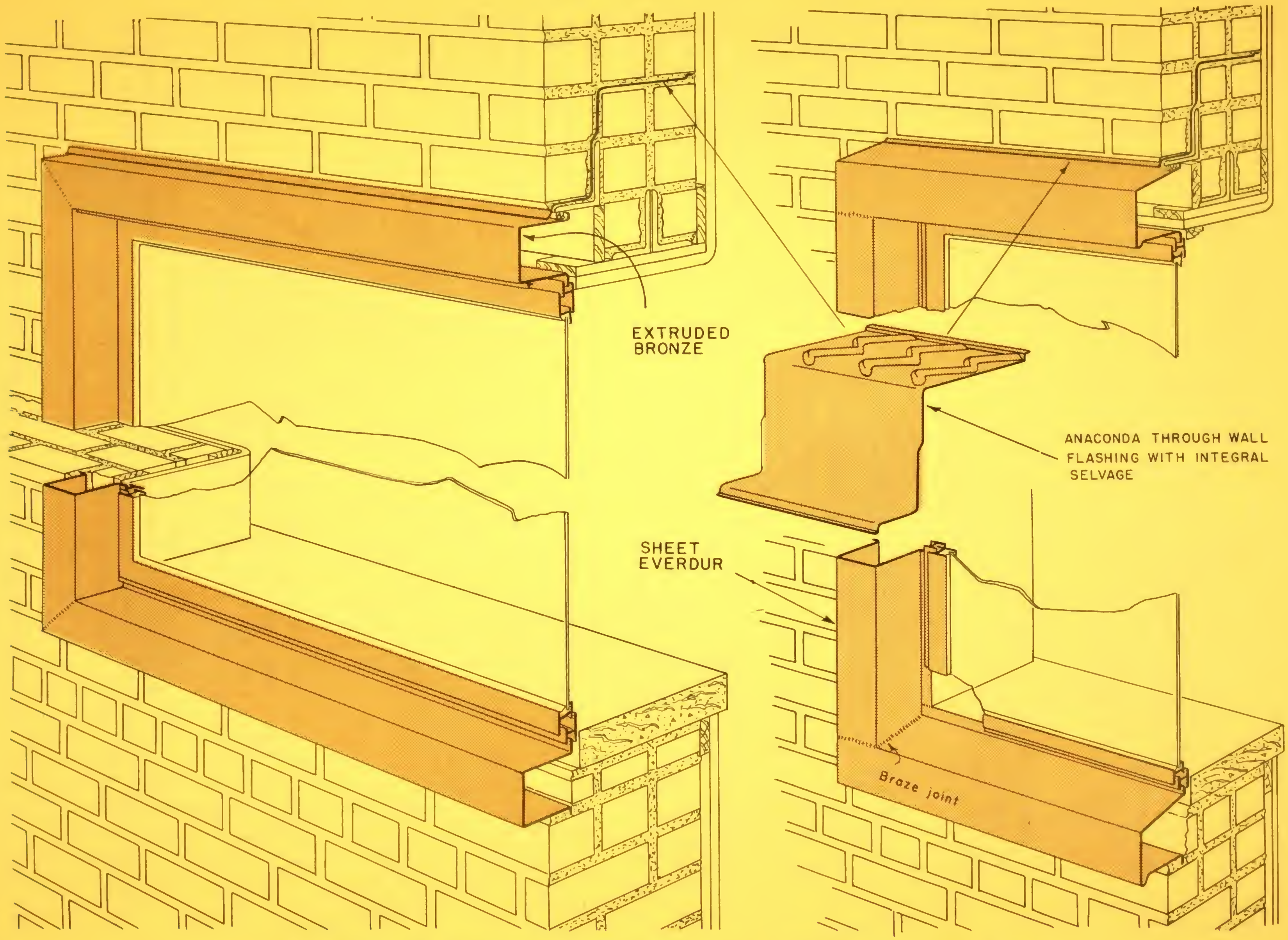
FIGURE #2 - Copper coping can be molded as well as plain, and can either be installed when the building is built or later. Note the construction of the expansion joint.

FIGURE #3 - This style of coping with a flush type expansion joint every 24' is one of the most common forms of coping and serves as a counter flashing on the side toward the roof. In some localities it is more or less regular practice to connect the coping with the base flashing by means of a loose clinch lock joint which allows a reasonable amount of shrinkage or an adjustment in the roof deck, as well as permitting the coping to slide with changes in temperature, especially when the broad surface of the coping is exposed to the direct heat of the summer sun.

FIGURE #4 - This style of coping is probably the least expensive and introduces another style of expansion joint which with the use of a strip of flashing called the tongue, is reasonably weather-tight. In this coping, as well as with all copings of copper or of any other metal, it is of first importance that the metal be stiff, straight and of a gauge sufficiently heavy to avoid visible buckling. Toward this end it is imperative that the edge fastenings be free to slide and that expansion joints be provided at intervals of not over 24'. It is also important that the work be neatly done, and that there be no blemishes in the metal or stains from soldering flux. Any of the metal that has accidentally been creased or otherwise damaged should be laid aside, and replaced with metal in perfect condition. Since copper copings properly designed and constructed are part of the architecture of the building they should be cleaned and left plain, or finished with chemicals for the artificial patina, or painted, if desired by the architect and owner.

METAL SURROUNDS - WINDOW

A.I.A. 12



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

METAL SURROUNDS FOR WINDOWS

For certain desirable architectural effects in modern design with large windows, particularly of the band type, surrounds have been employed to produce a very pleasing effect by creating the appearance of a picture frame outlining the window opening.

The surround is a medium by which the window can be given a new look. By its use it is possible to avoid the deep socket of old and to bring the window to a plane, practically in line with the outer face of the building wall, and yet to do an effective job of flashing or weatherproofing the window.

Surrounds can be made of several kinds of metal, but in any case should be stiff enough to produce a neat and shapely appearance and to be not easily damaged. This, of course, depends largely upon size and breadth of the plain surfaces, but in general should be of .032" gauge or heavier with proper stiffening. The joints should be blind soldered and reinforced, or preferably silver soldered or brazed when the gauge of metal is 1/16" thick or heavier. All exposed joints should be flush, of the hair line type, finished entirely smooth by grinding or by other means. The work to be finished by an acceptable method of cleaning, and with a spray coat of best quality outdoor lacquer, or with any other kind of finish that may be desired.

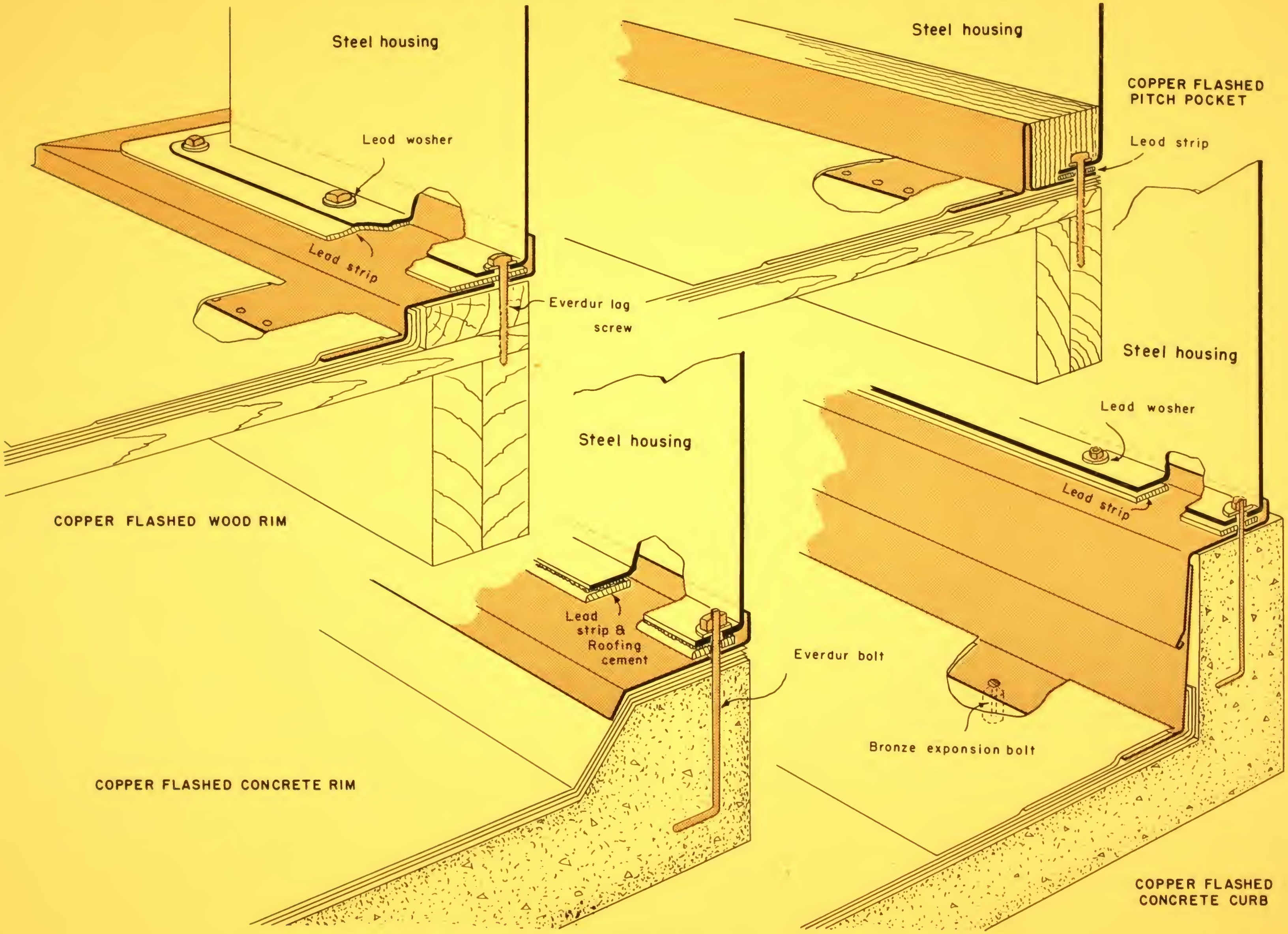
Surrounds having the warmth of brass or copper are particularly effective since the color and appearance of these metals combine very happily with the vitalizing effect of glass. The brass looks its best with a mat or scratch brush finish, and copper with its salmon pink coloring looks richest when finished with a rubbing of steel wool. Of course, there is also the possibility of having the antique effect produced by a spray application of ammonium sulfate. The result is an artificial patina, either plain or speckled, and the effect is quite unique when the work is successfully done. If a white metal is desired for surrounds, a warm white can be obtained by using a nickel silver, that is, when nickel is available and permitted for such a use.

This drawing shows surrounds of sheet metal. It is equally practicable to make surrounds of extruded metal, which in the realm of architectural alloys of copper means the brass color of architectural bronze and with nickel silver extrusions you get the warm white of an alloy containing 10% or 13% nickel, the balance of copper.

FLASHING — ROOF CURBS

A.I.A. 12

ANACONDA SHEET COPPER



ANACONDA AMERICAN BRASS LIMITED — NEW TORONTO, ONT.

FLASHING OF ROOF CURBS

On a modern building having a flat roof there are several kinds of equipment and parts of construction on the roof that require a curb properly flashed so that any accumulation of water will not find its way to the interior at the location of the various holes or extensions through the roof.

There is always the penthouse for a stair or elevator tower, or possibly a scuttle, skylights of one kind or another, and, of course, ducts or a penthouse for ventilation. Also, in this age of year-round air conditioning, there is the cooling tower or an evaporative condenser, and possibly a solar heater, or banks of finned coils as an evaporator-condenser for a heat pump. Then, of course, there are always the vent pipes for plumbing, and possibly a flagpole base and pedestals for advertising signs, as well as stub columns for future extensions, all of which project through the roof and require flashing.

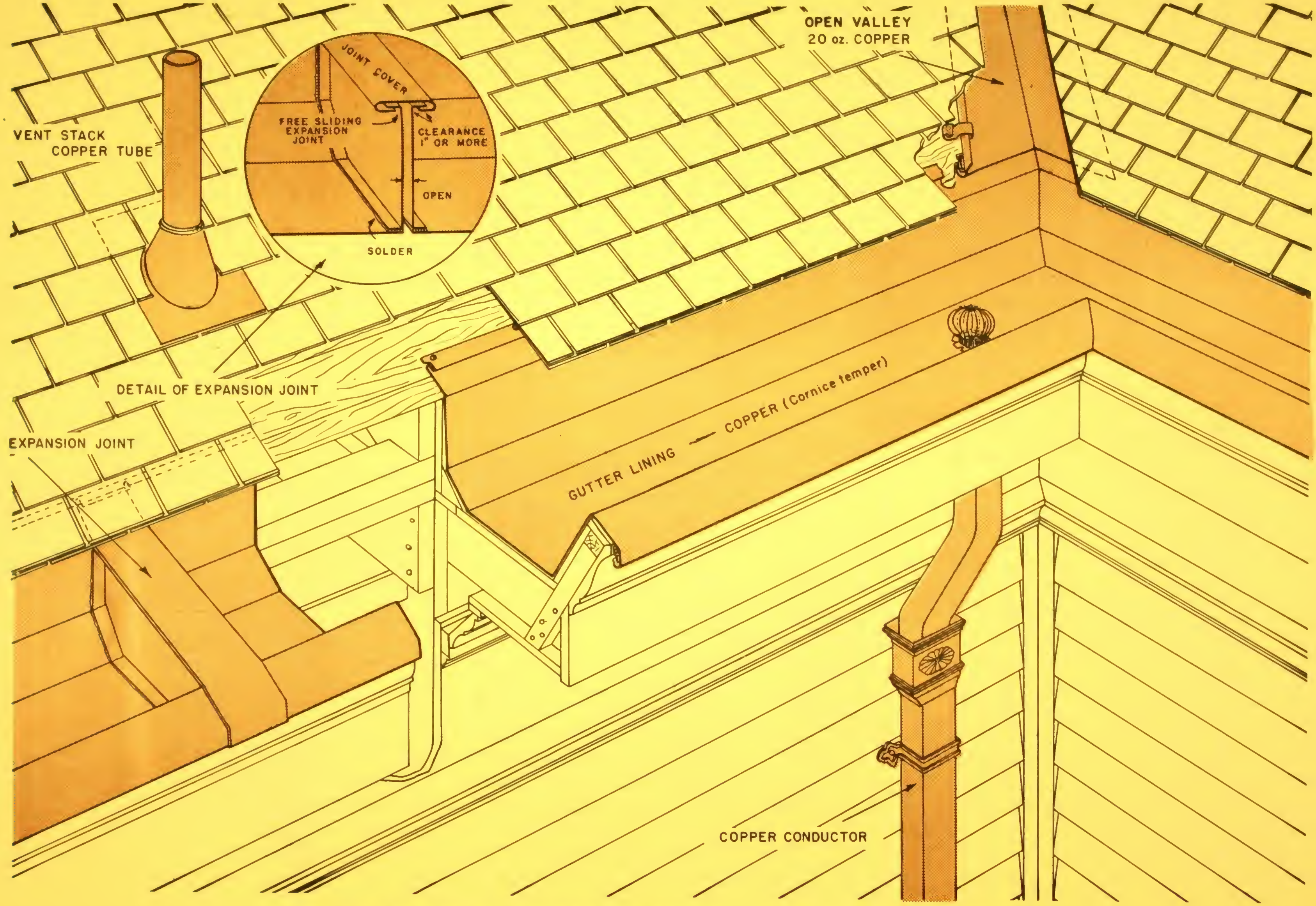
This drawing shows an assortment of curb flashing details for both fireproof and for wood construction. It also shows the more difficult kind of flashing, that for a piece of equipment with a metal housing, such as might be the case with a roof fan, a dust collector, or an evaporative condenser. In this type of construction it is necessary to isolate unlike metals to avoid galvanic action or corrosion. You will note that the isolating of one active metal from another is done with strips of lead and lead washers, lead, of course, being neutral and electro-chemically inactive.

In general 16 oz. copper of cornice temper is satisfactory for all curb flashing. If the curb should be large in size and height, or if the base flashing for the roof is of heavier copper than 16 oz. gauge, then the copper for at least the base flashing around the curbs should be of 20 oz. gauge of cornice temper. The correct temper is very important because a base flashing, in order to stay firmly in place without danger of breaking the bond with the relatively brittle bituminous built-up roofing in cold weather, must be fastened securely to the roof deck, and must also be soldered at the corners and wherever necessary to make the construction tight against an actual head of water. The base flashing should have a 4" horizontal flange built into the composition roofing, the flange being secured to the roof deck with 7/8" #12 copper nails on 3" centers if the deck is of wood, and with 1/4" threaded bronze expansion bolts with lead shields at 12" spacing for a concrete deck or other fireproof construction.

GUTTER-BUILT IN

A.I.A. 12

ANACONDA SHEET COPPER



ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

BUILT-IN GUTTERS

For best appearance in buildings of classic design with overhanging cornices and particularly for important buildings larger than house size, gutters for disposing of rain water are built into and concealed behind the cornice. The copper linings for built-in gutters are likely to be subjected to rough usage and unusual stress because of being confined in the trough of wood or concrete which forms the gutter. In the design and installation of built-in gutters of copper a certain procedure and precautions as learned from experience should be followed. To begin with the copper should be of a gauge corresponding to the scale of the work. For instance, a gutter like that shown on the drawing, of a size commonly found on houses with a bottom 8" wide can be of 16 oz. copper; one with a bottom 12" wide, 20 oz. copper; 18" wide, 24 oz. copper; and 32 oz. copper for anything above.

A thing of equal importance is that the copper be of cornice temper, and not of roofing temper. The stiffer the copper, within practical limits, the more able it is to distribute and to absorb stresses due to expansion and contraction. All gutters must have free sliding edges, also expansion joints located midway between the downspouts. There are instances where copper gutter linings with excellent workmanship were spoiled by stitching the outer edge with nails driven directly through the copper into the crown mold, also by nailing the apron extending up under the shingles to the roof boarding instead of fastening with cleats. In some cases this apron has been pinched so tightly to the roof boarding by the first courses of shingles that the copper was unable to move by expansion without unduly buckling the copper of the gutter lining.

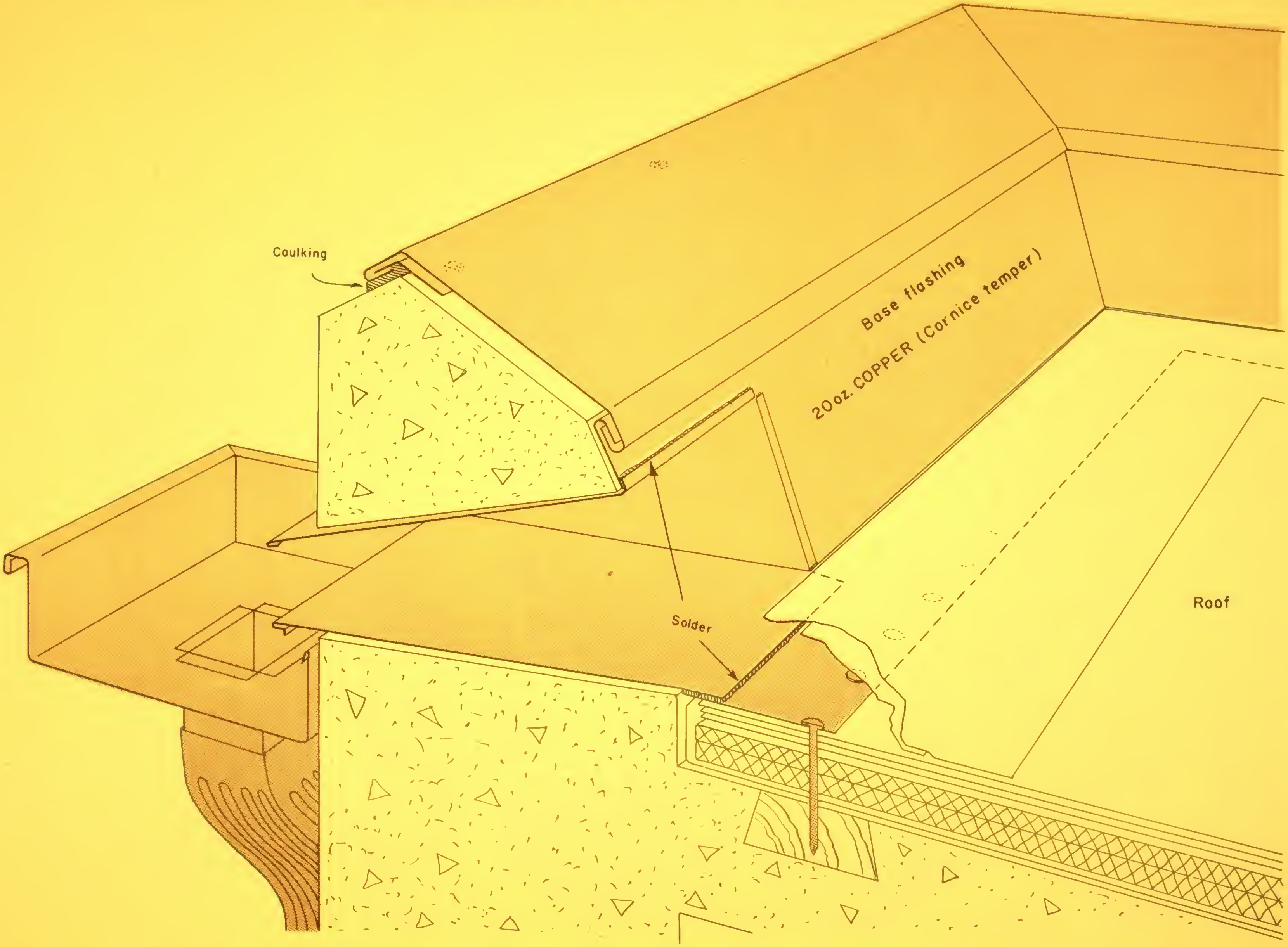
Expansion joints across the gutter have the effect of cutting the gutter in two at the halfway point between the downspouts. This detail is very effective in preventing cumulative stresses in the copper of the gutter, provided the expansion joints are free to function and are not pinned down with solder as is sometimes carelessly done when the cover piece is put in place.

Built-in gutters may have slight disadvantages mingled with the good. Nevertheless they are preferred over pole gutters or hanging gutters. They are favored because of being practically out of sight, they can handle more water and are not so easily damaged by sliding snow and by painters ladders, etc. Probably the most desirable feature of built-in gutters is that they preserve the architectural line at the eave.

FLASHING — DWARF PARAPET WITH SCUPPER

A.I.A. 12

ANACONDA SHEET COPPER



ANACONDA AMERICAN BRASS LIMITED — NEW TORONTO, ONT.

FLASHING - DWARF PARAPET WITH SCUPPER

With contemporary architecture wherein the parapet above the roof is reduced to only a curb and where the winter climate is not too severe, architects may choose to use the least expensive method of disposing of rain water, that of causing the water to flow through scuppers into sheet copper leader heads and conductors on the outside of the walls. This is the simplest method of handling the water when there is no storm sewer available. Not only does the utility of this method of construction have an influence on the designer's choice, but also the architecture, or character that is imparted to the design by properly proportioned leader heads and conductors.

This detail drawing shows a base flashing and scupper secured to the roof deck and made water-tight with solder. These parts should be made of cold rolled cornice temper copper, 20 oz. or heavier, and should have expansion joints wherever expansion is provided for in the structure.

Connected to the base flashing with a loose clinch lock and without solder, is a copper coping which avoids the troubles that usually occur, with copings of bare stone or concrete having vertical joints. The additional cost for the copper is offset and returned many times by saving maintenance expense that is inherent with copings that are not protected with metal. The copper coping should likewise be furnished in cornice temper, and of 16 oz. gauge. Neat, free sliding joints that are simple and weather-tight should be located at 24' intervals along the length of the coping. The mitered corners of the coping and the base flashing, as well as the end joints of all the sheets in the base flashing should be clinch locked and soldered.

The conductors, for reasons of economy should be of the standard variety of size and shapes, which, of course, are furnished only in 16 oz. copper. The leader heads which are usually to be of the architect's individual design should be of cold rolled copper for trim appearance, and the gauge should be of 20 oz. or 24 oz. depending upon size and form. The means for fastening can be in the nature of regular conductor straps or they can be made of bar stock to suit the architect's design.

ROOFING – STANDING SEAM – PAN METHOD

A.I.A. 12

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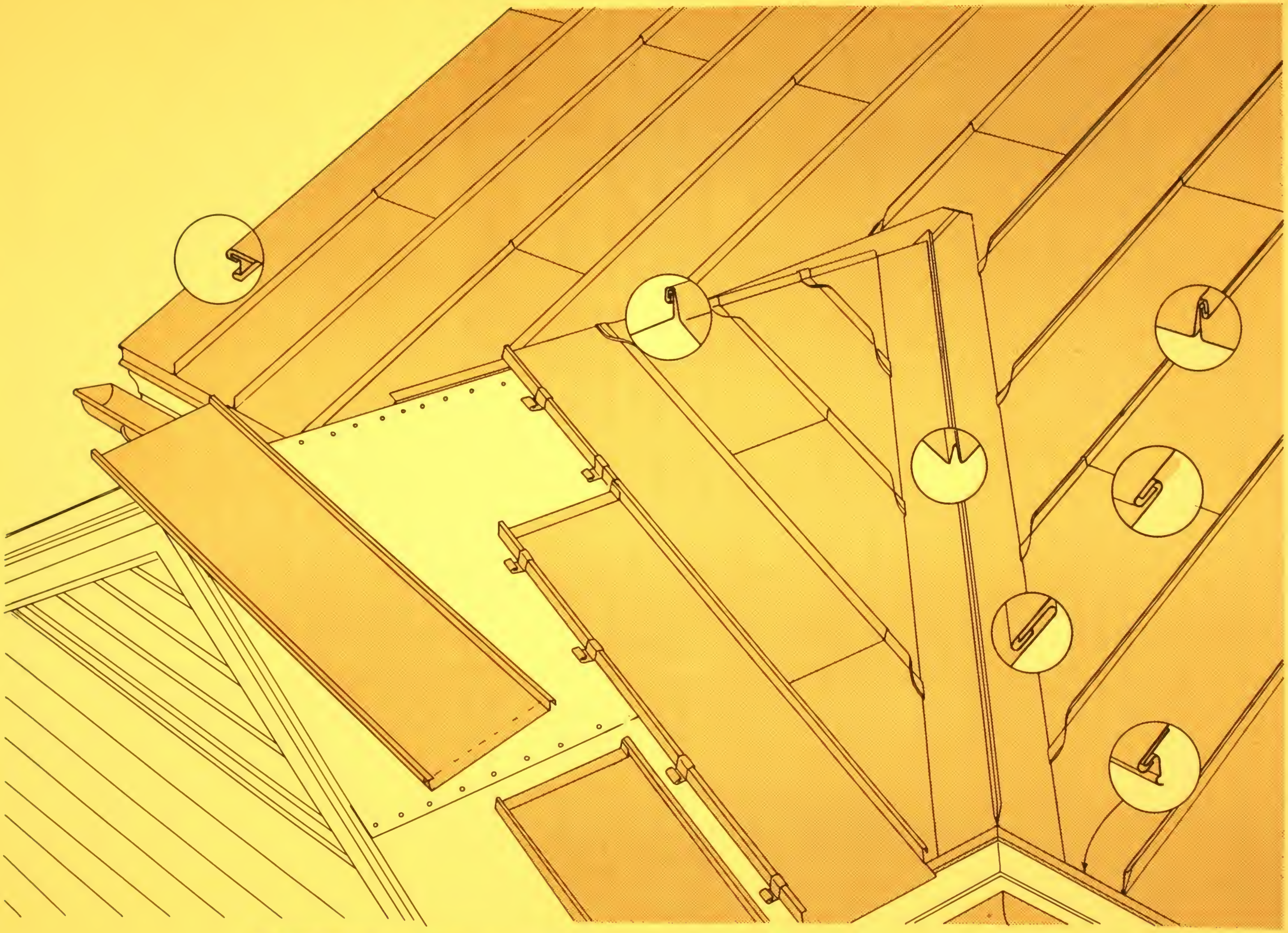

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ROOFING - STANDING SEAM (Pan Method)

In the early days of standing seam roofing it was customary to assemble the strips of copper endwise extending from ridge to eave, then to form upstanding edges on these long strips with the aid of edging tongs. The channel roofing strips were then moved into position, fastened to the roof deck and double lock standing seams were made with either hand seamers or special double seaming tongs known as "kickers." Sometime later when the bending brake came into being it was found that a nicer job could be done by forming 8' lengths of sheet copper into roofing pans by means of that new device. In this procedure there is the advantage of forming the pans as complete as possible in the shop, and making the work of installing on the roof quite simple and easy. It being necessary only to close the last two bends of the double lock standing seams with hand tools.

Standing seam copper roofing by the pan method is generally made of 16 oz. copper. The sheets measuring 20" wide x 8' long. The ends of the sheets are folded with 3/4" reverse bends so as to form a clinch lock when assembled end to end. The edges are then folded so as to finish either with a 3/4" or 1" standing seam.

The pan method has been used with "Economy Copper Roofing" consisting of sheets 16" wide only and 72" long of 10 oz. gauge, and designed principally for residential work. The technique of forming and applying is exactly the same as for 16 oz. copper. Either of these gauges of copper lend themselves very well to a 3/4" height of seam. That size of seam is the most likely to remain straight, and produces a very desirable architectural shadow line.

The drawing illustrates a suggested scheme of applying copper roofing on a house by the pan method. The details show a 3/4" common clinch lock forming the cross seams, and a clinch lock at the junction of the roof pans and valley. This lock is made up of 3/4" and 1-1/2" bends which offers greater protection where the heavy flow of water, and the possible lodging of slushy snow occurs. The valley has a comb or ridge in the center to interrupt the onrush of water from a wide slope, and to arrest and steady the flow of water in the center of the valley. This feature is not necessary where the length of slope on both sides of the valley is equal.

ROOFING — BAY WINDOW

A.I.A. 12

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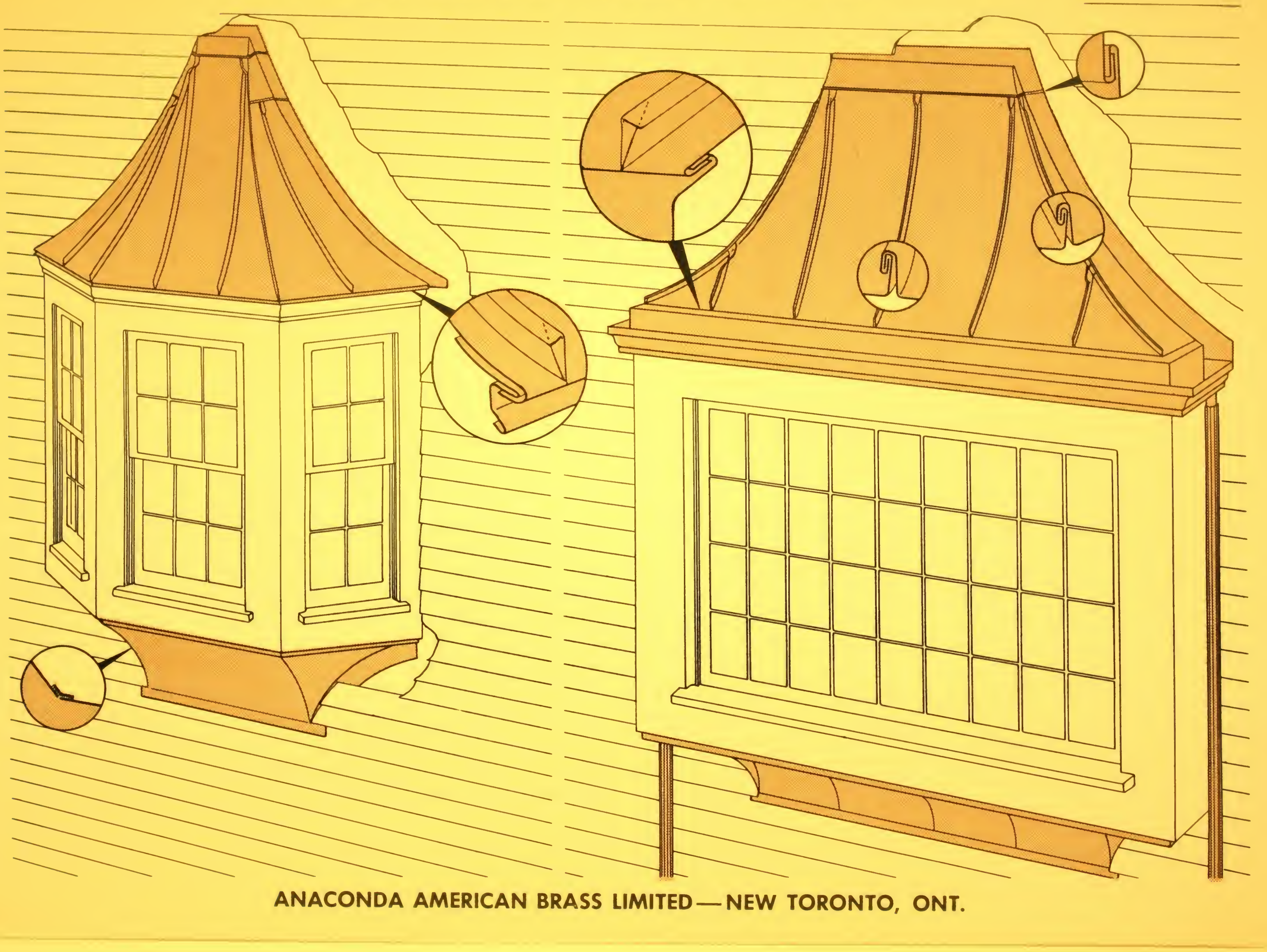

ROOFING - BAY WINDOWS

There are no building materials that are so adaptable to curves and other difficult formations like sheet metal, and copper is the most suitable because of its pliability, ease of joining and soldering, aside from being the most attractive when it takes on the familiar green patina upon exposure to the weather.

Curved roof surfaces on bay windows, entrance hoods, conical turrets and the like, including the curved sweeps under bay windows, can best be made with sheet copper, with blind soldered joints, or with the double lock or the standing seam method of joining.

For best appearance the copper should be of cornice temper. When the whole slope of a bay window or a hood is made of a single sheet of copper, it should be of 20 oz. or 24 oz. gauge. If the work is to be done with the standing seam method of joining, copper sheets of 16 oz. gauge or Economy Copper Roofing (16" x 72" strips in 10 oz. gauge) is suitable. Often the 10 oz. copper with 3/4" standing seams and narrower spacing between seams produces the best architectural effect. Also the closer seam spacing provides strength, rigidity and wind resistance comparable to that obtained by using heavier sheets with wider spacing between the standing seams. If the radius of the curvature is short, the uppermost edges of the upstanding legs of the roof pans should be crimped before the double lock seams are made.

The procedure in applying the standing seam roofing is quite regular except that the work of flashing the vertical walls and finishing at the eave, as well as at the underside of the bay windows is special and peculiar to the requirements of the design. The eave may be provided with a drip edge or may have architectural or half round hanging gutters with suitable leaders to carry away the rain water. The designer should take special care that all drip edges be of generous proportion.

The copper on a hood or bay window roof may be left plain and allowed to weather, or it can be painted, if desired. Wiping the copper with boiled or raw linseed oil, as is sometimes done, should be avoided so that the more attractive color of the natural patina will come sooner.

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EXPANSION JOINTS — EXPANSIBLE INTERSECTIONS

A.I.A. 12

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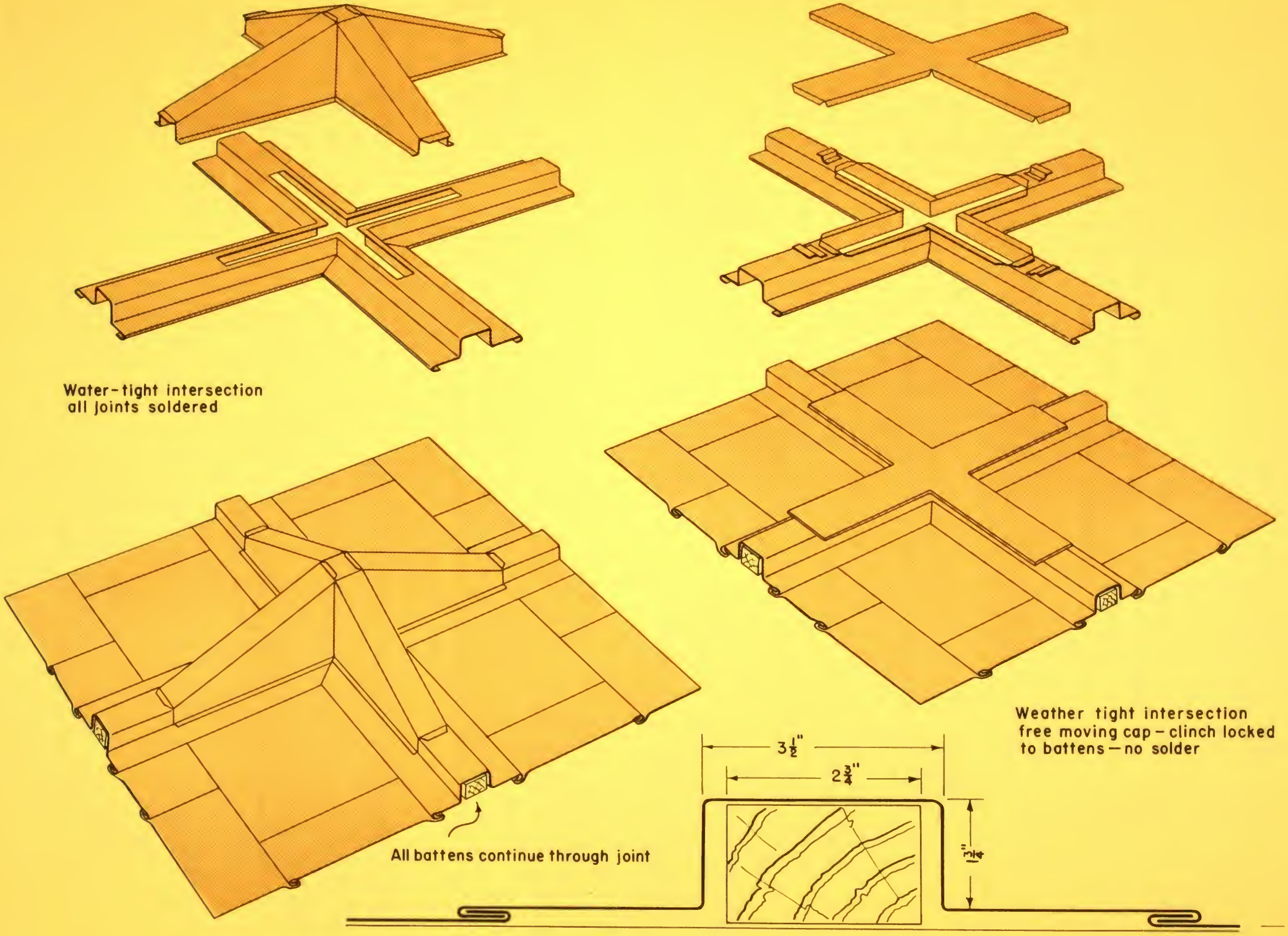

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EXPANSIBLE INTERSECTIONS

In dry lock seam construction, usually in the form of standing seams or batten seams in roofing, the expansion and contraction of the metal is absorbed or compensated for in the loose lock joints or by the bellows or hinge action that can take place. On vertical walls with the proper proportioning of the squares of copper, even a clinch lock seam without solder may be suitable, since such work needs only to be weather-tight or safe against wind driven rain.

On dead level roofs, or for roofs that are to be flooded, as well as for large tanks where there is an actual head of water, the joints in the copper work must necessarily be locked and soldered. For good and lasting construction this requires that the area be divided into rectangles not over 40' square surrounded by expansion battens. The copper over these battens is to have a clearance on each side of the structural batten to allow a certain amount of leeway for expansion and contraction. For this type of construction it is imperative that the copper be cold rolled to what is known to the trade as cornice temper and that it be of a gauge upwards of 16 oz. per sq. ft.

Although the regular expansion batten makes a weather-tight and water-tight construction, and provides adequate freedom for adjustment of the copper within a 40 foot rectangle, it presents a problem at the point of intersection of two battens. This is particularly so on long roofs with expansion battens running the full length, because the contraction in such a length of batten could possibly cause a pulling away of the copper work at the ends.

The answer to that problem is in the design of expansible intersections. There are two types shown - one is for water-tight construction and the other for weather-tight construction. The former consists of a raised cover piece about 6" high which is soldered in place and which due to the fullness of metal in its design can flatten and yield in every conceivable direction. This type, of course, is for a flooded condition. The other type has a sliding cover at the intersection. In each case the metal on top of the battens is cut away a distance of about 18" in four directions to allow the battens to shorten, due to contraction, in cold weather. The sliding cover is only to make the cutaway section over the battens weather-tight. This type of expansible intersection is used on the crown of a vaulted roof or at the ridge of a roof with a low pitch where flat lock soldered seam construction is used in the roofing.

The copper for all soldered work must be of cornice temper because it is the better able to withstand stress and strain. This is due to its additional stiffness and to other favorable characteristics. It also makes for better appearance in the finished work. For small areas where the rectangles are less than 40' square 16 oz. copper is suitable, but for larger work on first-class buildings and for greater assurance of permanence, copper of 20 oz. gauge for the roofing squares and for the battens is preferred.

EXPANSION JOINTS — VERTICAL & HORIZONTAL

A.I.A. 12

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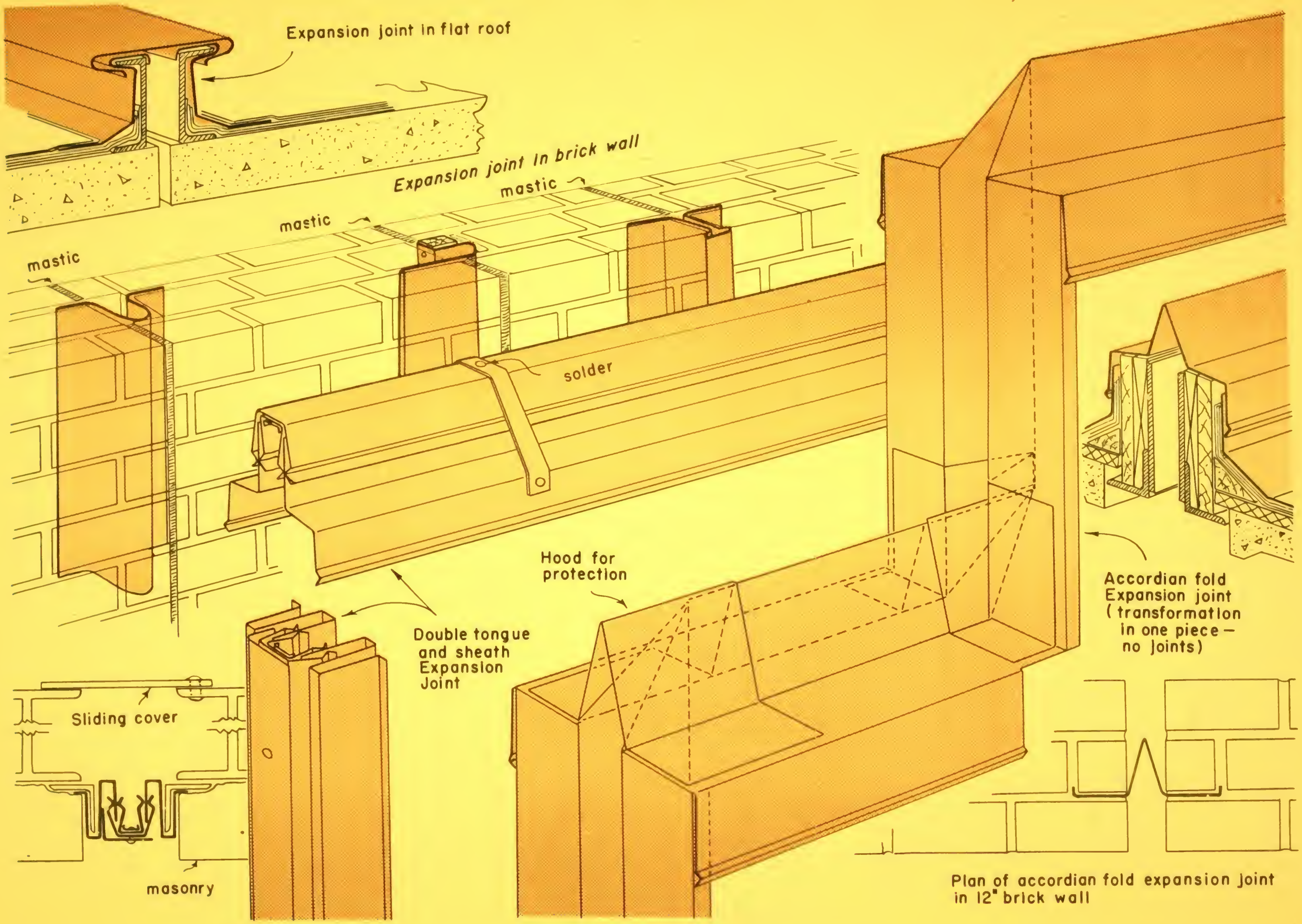

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EXPANSION JOINTS

It is well known that all building materials are subject to dimensional change from expansion and contraction caused by differences in temperature. In the construction of small buildings the amount of movement from that cause is negligible, but in large buildings the matter of expansion and contraction becomes a serious structural problem. Actually the weather and sunlight produce complex stresses within the walls and roof of a large building, particularly if it is long and tall, or if it has considerable plan area.

Vertical expansion and contraction are affected by the sun, by shade and exposure. The sunny side of a building naturally tends to expand considerably more than the side that is in the shade. Horizontal expansion also varies, depending on the size and shape of the building and its setting. It is the least near grade because of the cooling effect of the earth that is in contact with the foundation. As the building rises above the shadow of adjacent structures and trees, and where it is fully exposed to sunlight, the tendency for horizontal expansion is greatest. If buildings of such a size were not equipped with expansion joints they would soon develop cracks in the masonry and these cracks would admit water, which in cold climates would freeze and eventually lead to irreparable damage or at least to costly maintenance.

In the light of experience with the effects of expansion and contraction on relatively brittle materials such as masonry of brick, stone and terra cotta, architects and engineers have learned to introduce structural cleavages in buildings in the form of expansion joints which isolate certain divisions of the plan area as independent structural units. The very large buildings are usually divided into rectangles of about 200' square by means of these expansion joints. The joints are designed with a clearance of at least a half inch and are most commonly flashed or double flashed with copper.

The expansion joints are concealed on the inside with sliding covers so as not to be noticeable. On the outside, the joint, if not too wide, is filled with a compressible fiber and finished with caulking compound of a suitable color. A wide joint is built-up neatly with masonry and allowed to show as an architectural chase or channel. The flashing in that type of joint is made as inconspicuous as possible by means of paint of a suitable color.

This drawing shows several types of expansion joints, all of which have been used, possibly with slight modification. In general, it is recommended that the copper be of cornice temper, and of a gauge that is in keeping with the class and character of the work. For use in small buildings, 16 oz. copper is usually specified, but in large structures where neat appearance and durability are of prime consideration, copper of 20 oz. gauge is recommended. In providing for movement in the expansion joints themselves, it is common practice to simply weather lap the copper in all vertical runs, but in horizontal runs the end joints of the 8' lengths of copper should be pretinned, lapped, riveted and soldered, except that there should be free sliding sleeve type slip joints at 24' intervals designed to allow expansion and contraction and to remain weather-tight.

FLASHING — GABLE TO STUCCO WALL

A.I.A. 12

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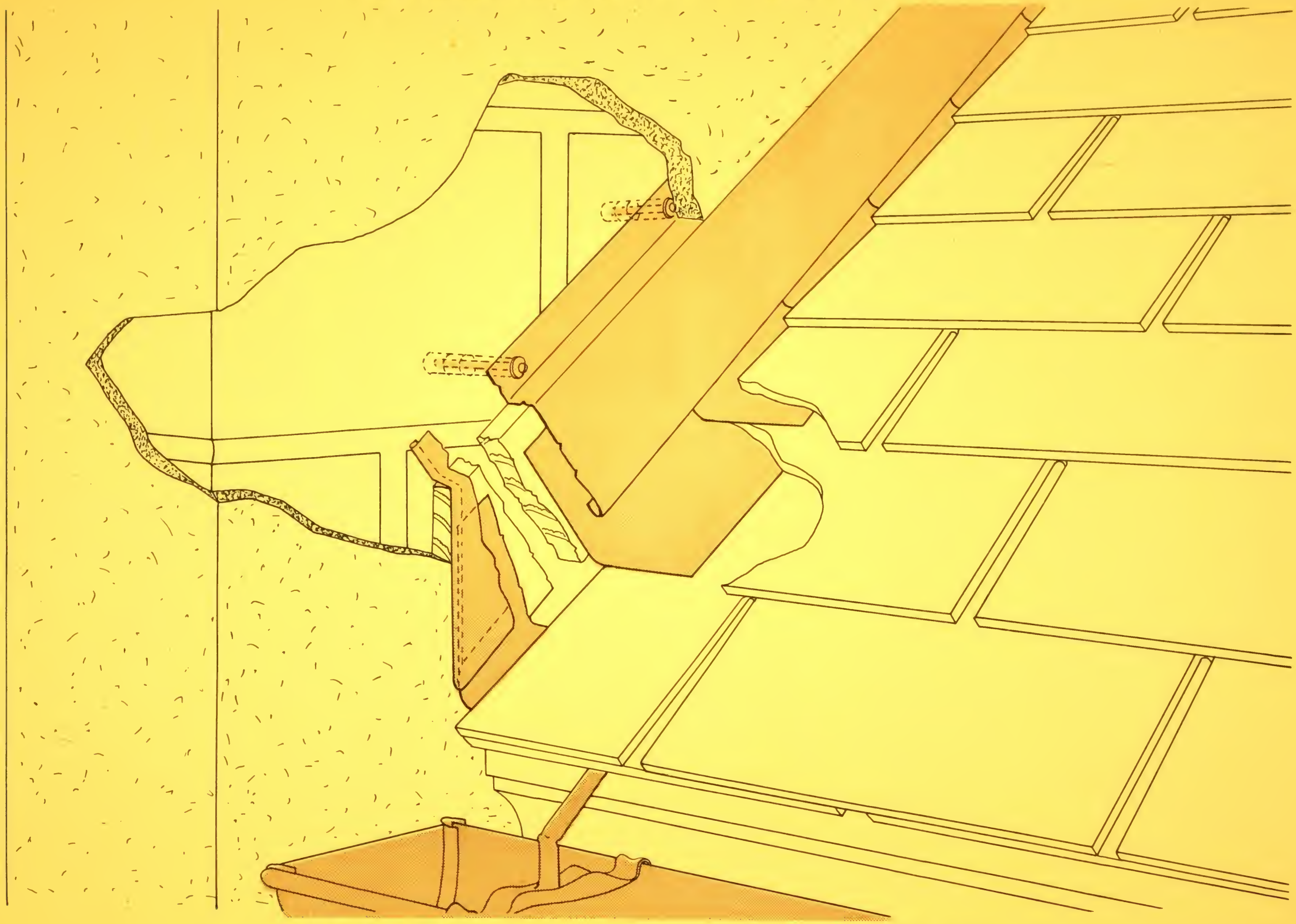

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FLASHING - GABLE END - STUCCO WALL

In warm climates where there is no danger of damage to building materials from frost, stucco has been found to be a very desirable and economical exterior facing for buildings. Because of the plasticity and the setting quality of stucco, and its ease of application, it is used very extensively in many parts of the earth. The satisfaction that has been gained from its use in warm climates has had a great deal of influence on architecture. Actually there are certain types of design that depend upon stucco for their full architectural expression, including present day international or contemporary architecture.

Stucco may be applied to walls of brick, terra cotta, or to cement blocks of the various kinds and to metal lath. With all of those backing materials, the problem of flashing is practically the same, and can best be done with copper, for unlike some other metals copper can be in contact with wet stucco without likelihood of harm to either material.

This drawing shows a simple method of flashing and counter flashing at the junction of a sloping roof and a vertical wall. The counter flashing is installed before the stucco is applied. It is placed over a wood ground with a slight clearance on the outer side to allow the base flashing, consisting of flashing squares woven into each course of shingles, to be shoved into place with its vertical leg extending upward and behind the vertical facing of the counter flashing. For a neat and trim appearance the counter flashing should be of cold rolled copper, and of 16 oz. or 20 oz. gauge. It should be fastened to the masonry with expansion type brass screws and lead shields at intervals of not over 6". All of the bends in the counter flashing should be made with a bending brake to assure a neat and workmanlike appearance. The base flashing is shown to be of 7" x 7" flashing squares of 16 oz. copper bent in the middle, leaving a 3-1/2" flashing flange, both vertical and horizontal.

Suitable drip edges should be provided to avoid the possibility of discoloring adjacent stucco by the wash that may be laden with dust, soot and other matter. This usually consists of a hemmed bottom edge on the exposed vertical flashings, canted outward at an angle of 45°. Some architects specify lead coated copper as an additional precaution.

ROOFING — SPIRE

A.I.A. 12

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COPPER COVERED SPIRES

It is well known from experience that it is difficult, particularly in cold climates to build permanently waterproof masonry walls having a batter such as those of a spire. It is also uneconomical to maintain a spire that is made of materials that need paint for their protection and durability. The ideal would be to have a church with a spire that would never require any outlay for maintenance. This can probably be more nearly accomplished by covering the spire with copper applied in accordance with the recognized best practice in the trade.

This drawing shows a copper covered spire, octagonal in plan having battens at the eighth points, and horizontal courses of copper between the battens made weather-tight by means of dry clinch lock construction. In general, the technique for applying the copper is the same as that for batten seam roofing. The details for edgings, etc. are simple and the copper covering of the spire is built into the wood construction of the ventilating dormers at the base. The drawing also shows alternate types of battens or methods of joining at the corners of the octagonal plan of the spire.

For spires of the ordinary size, 16 oz. copper of cornice temper should do very well. For large spires 20 oz. copper of cornice temper might be preferred because of the lesser likelihood of showing buckles in the metal. The fastening should be by means of copper cleats and copper or bronze nails of which 7/8" x #12 are more or less standard.

If the copper is washed clean of grease and oil with a solution of caustic soda after the work is done, it will soon be on its way to attaining the beautiful green patina which is nature's decoration, and thence the spire will become an object of elegance and more than likely a creditable landmark in the community. If, on the other hand, the architecture calls for a white spire, this can be accomplished by washing the copper in the same manner and painting with a good quality of outdoor paint.

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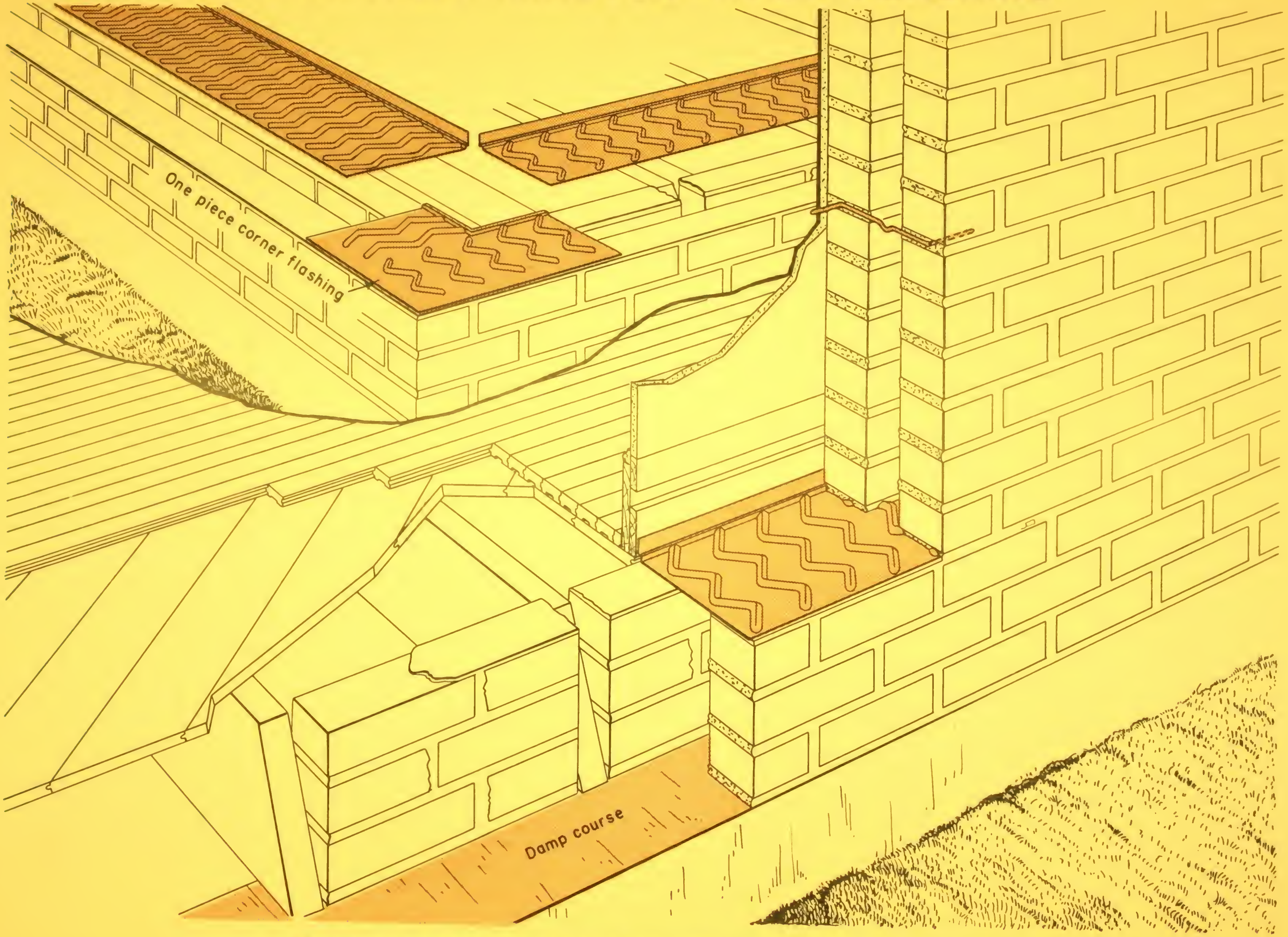
FLASHING — CAVITY WALL

A.I.A. 12

ANACONDA THROUGH-WALL FLASHING



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THROUGH-WALL FLASHING FOR CAVITY WALL

A cavity wall consists of masonry, most generally of brick, in which the outer facing of the masonry is free standing and separated from the inner masonry of the wall by an air space, usually about 2" wide. This air space is quite valuable in that it retards heat flow, both inward and outward through the wall. It also prevents the penetration of moisture from the outside to the interior, and thereby obviates the need of furring on the inside of the wall as ordinarily done to protect the plaster that would otherwise become stained and damaged from moisture penetration. Thus through the insulation that it affords, as well as the cutting off of moisture penetration and its economical construction, the cavity wall deserves recommendation.

Theoretically there would be hardly any need for flashing, but for reasons of practical construction it is quite important that flashing of a permanent kind be built into the masonry where there is likely to be an accumulation of water, as near the water table or floor level, and at window and door openings where the sill is extended through or secured to the inner load bearing part of the wall for solid construction. Window heads should also be flashed where there is no sufficient protection from an overhanging cornice or the like. For this flashing there is nothing so suitable in every way as is copper.

This drawing shows the standard Anaconda Through-Wall Flashing extending through the wall at the level of the top of the floor joists. The flashing tends to stiffen the construction, and will save the joists and carrying timbers from the water that would otherwise reach them by filtering down through the masonry and which in time might cause decay and weakening of the structure. Such a through-wall flashing is necessary and desirable for certain practical reasons. Probably the more important reason is that considerable mortar falls into the air space as the bricks of the inner and outer wall are laid. This is conducive to absorption and the lateral flow of water at the bottom of the cavity where, due to the building-up of mortar, there is in effect a solid wall. The flashing will collect that water and will discharge it to the outside. There are also certain unavoidable connections between the outer and inner wall by means of withs or metal wall ties which, with an accumulation of droppings of mortar, form sufficient contact to conduct moisture across the air space.

The Anaconda Through-Wall Flashing because of its nesting and interlocking design, with one-piece corners, fits into place very readily and makes for good economical construction. The Anaconda flashing is normally furnished of 16 oz. copper. The window head and sill flashing can also be of 16 oz. copper, or of 10 oz. copper. The latter is furnished in sheets 16" x 72" known as Economy Copper Roofing stock, or in rolls 16" wide.

EXPANSION JOINT & BASE FLASHING

A.I.A. 12

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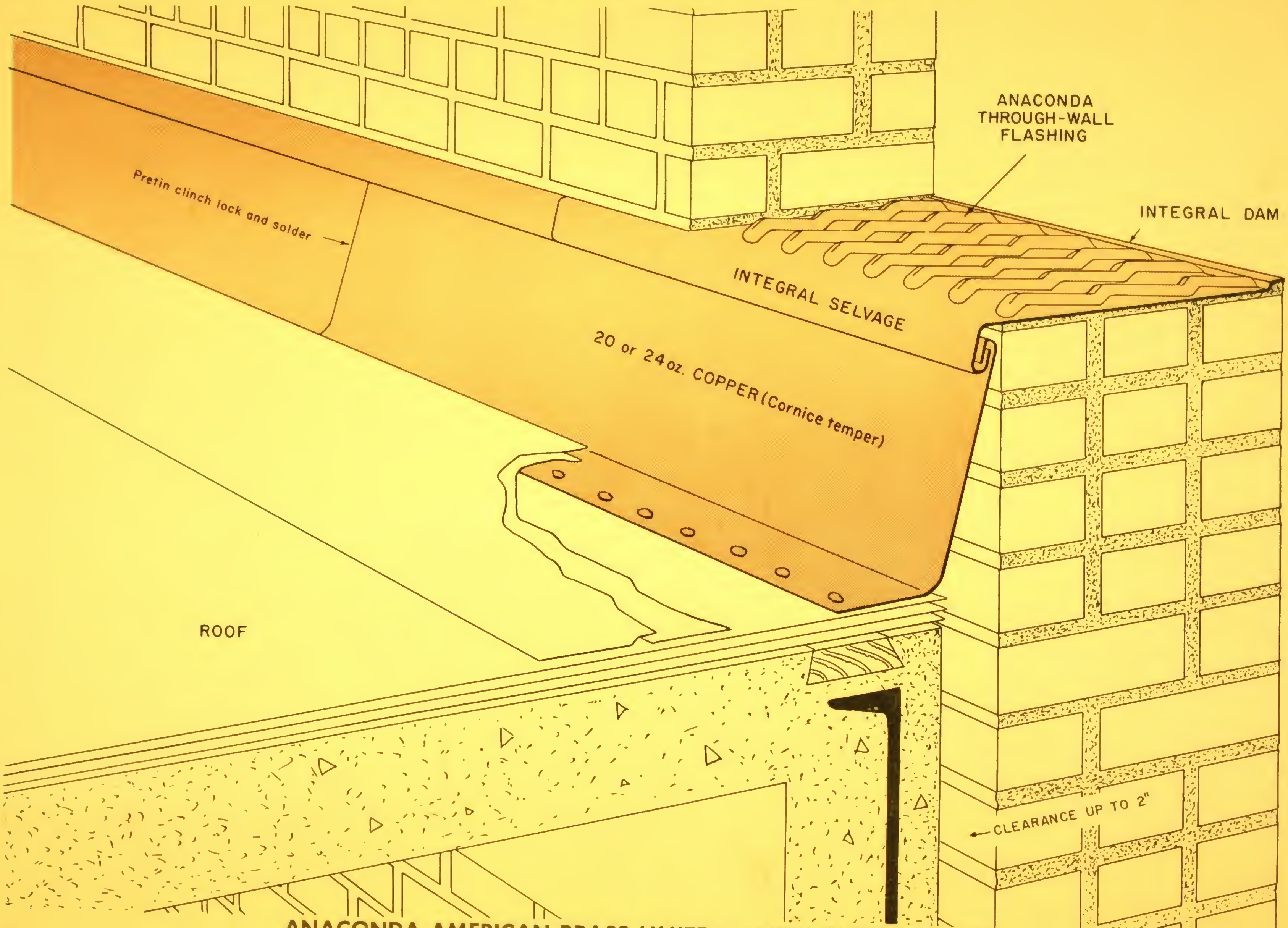

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EXPANSION JOINT AND BASE FLASHING

In large buildings and particularly those that have considerable plan area it has become more or less common among engineers to divide the plan into rectangles about 200' square, and thereby to produce free standing sections of building with a clearance up to 2" in width. This clearance being made weather-tight by means of copper expansion joints. In deciding on the location of expansion joints, the engineer or architect is likely to make the break in the structural framing and in the floors and walls where a low portion of the building adjoins a taller portion.

This drawing shows such an expansion joint in which standard Anaconda through-wall flashing and a base flashing of sheet copper are so arranged as to permit the necessary hinge action to allow the expansion joint to open and close from changes in temperature without stressing the copper. At the corners it is necessary to fold the metal of the base flashing to simulate the expansible folds of a bellows. The vertical expansion joint flashing at the outer wall can be made weather-tight with the horizontally extended part of the through-wall flashing.

The through-wall flashing is shown to be of standard 12-1/4" size with a 4" selvage to form a loose fitting 1-1/2" clinch lock, thus allowing for a certain amount of uneven settlement. The base flashing with a 4" roof flange and a vertical leg not over 12" high should be of 20 oz. or 24 oz. cold rolled copper fastened securely to the roof deck with copper nails or with anchor bolt fastenings. If nails are to be used they should be 7/8" #12 flat head copper, 3" on centers. If anchor bolts are to be used they should be 1/4" brass machine screws with lead expansion shields, spaced preferably 6" on centers, but not over 12" apart. The cross joints in the through-wall flashing are made complete by simply lapping the flashing one corrugation. In the base flashing the cross joints which occur at 8' intervals should be pretinned, clinch locked and soldered. In general, the soldering should be done on the back of the work so as not to be noticeable when installed. The few joints that must necessarily be soldered from the exposed side should be wiped clean and the excess solder scraped away.

ROOFING—STANDING SEAM (PAN FORMING DETAILS)

A.I.A. 12

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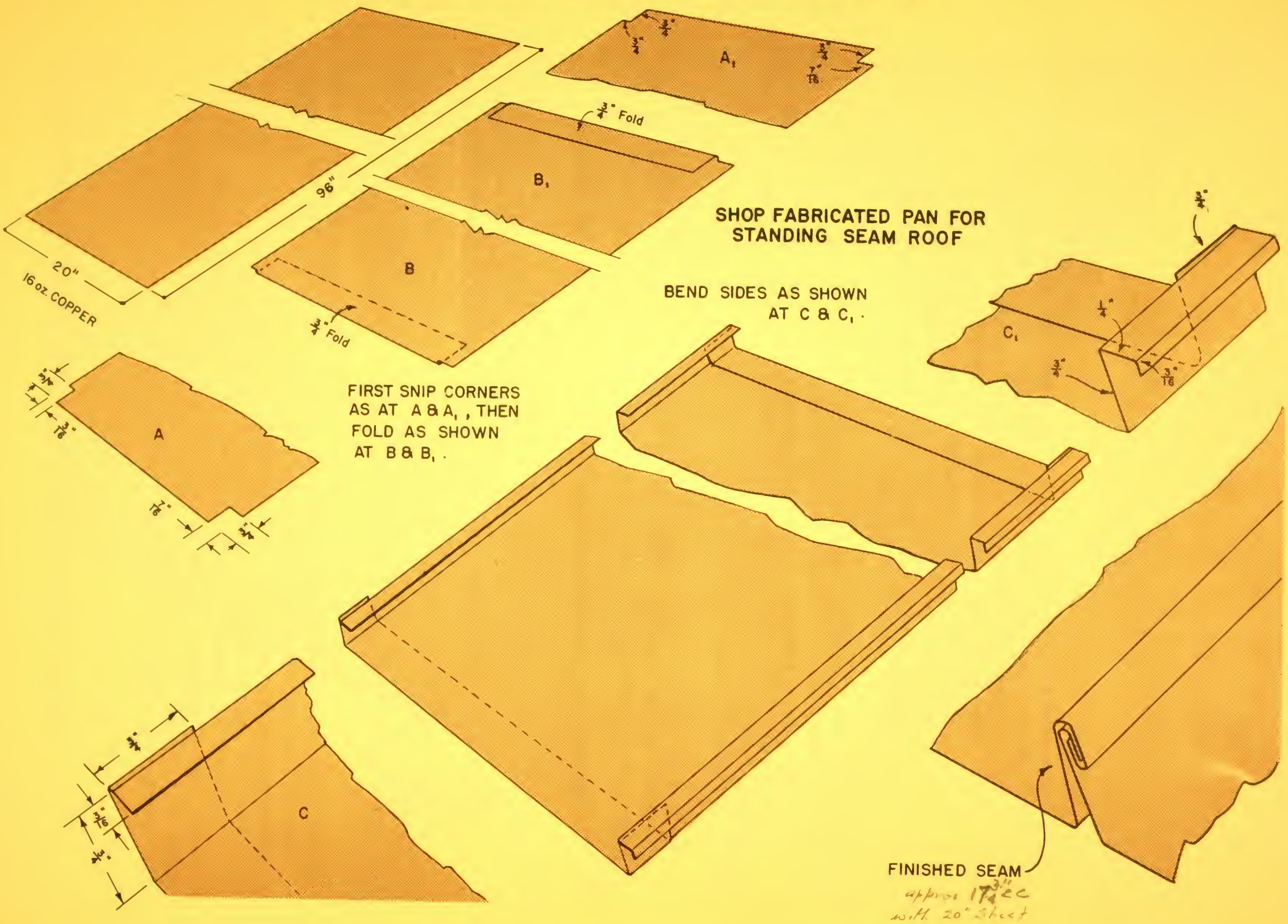

SHOP FABRICATED PAN FOR STANDING SEAM ROOF

BEND SIDES AS SHOWN AT C & C₁.

FIRST SNIP CORNERS AS AT A & A₁, THEN FOLD AS SHOWN AT B & B₁.

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

ROOFING - STANDING SEAM (Pan Forming Details)

This drawing shows the procedure in forming roof pans. It begins with a blank or plain sheet of copper, notching the corners to cut away some of the metal that is not needed to make a weather-tight construction, and which would only be troublesome in making the seams. This operation is followed by making the reverse bends at the top and bottom edges of the sheet, then turning up the sides with their additional small bends, thus forming pans that can easily be interlocked on the roof. There the standing seams are completed by making only two additional bends with regular hand tools.

The dimensions on this drawing are for a finished seam 3/4" high which actually looks quite well, and is similar to the seams in the copper roof on Christ Church in Philadelphia, the oldest roof in existence. This roof is well in its second century of service. In recent years, and particularly in roofs of tinned steel where the seams were commonly made with special tongs known as "kickers" the upstanding seams were finished 1" high. Whether the seams are to be 1" high or 3/4" high is largely a matter of taste.

The end locks of the roof pans as shown will form a simple single lock or clinch joint. For roofs that have a pitch of less than 6" per ft. it is sometimes considered good judgment to make the reverse bend at the bottom of the pan 1-1/2" wide instead of 3/4" so as to offer greater protection at the cross joints and to cushion the blasts of wind that could possibly force rain water into the joints. In that case it might also be considered wise to finish the standing seam 1" high. The 1" seam has a place on slopes having a pitch of less than 3" per foot where the cross seams are blind soldered on the reverse side to prevent infiltration of wind driven rain or backwater from ice or slushy snow in cold climates. Whenever soldering is resorted to, the copper must be of cornice temper and at least of 16 oz. gauge.

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GUTTER, BUILT-IN

A.I.A. 12

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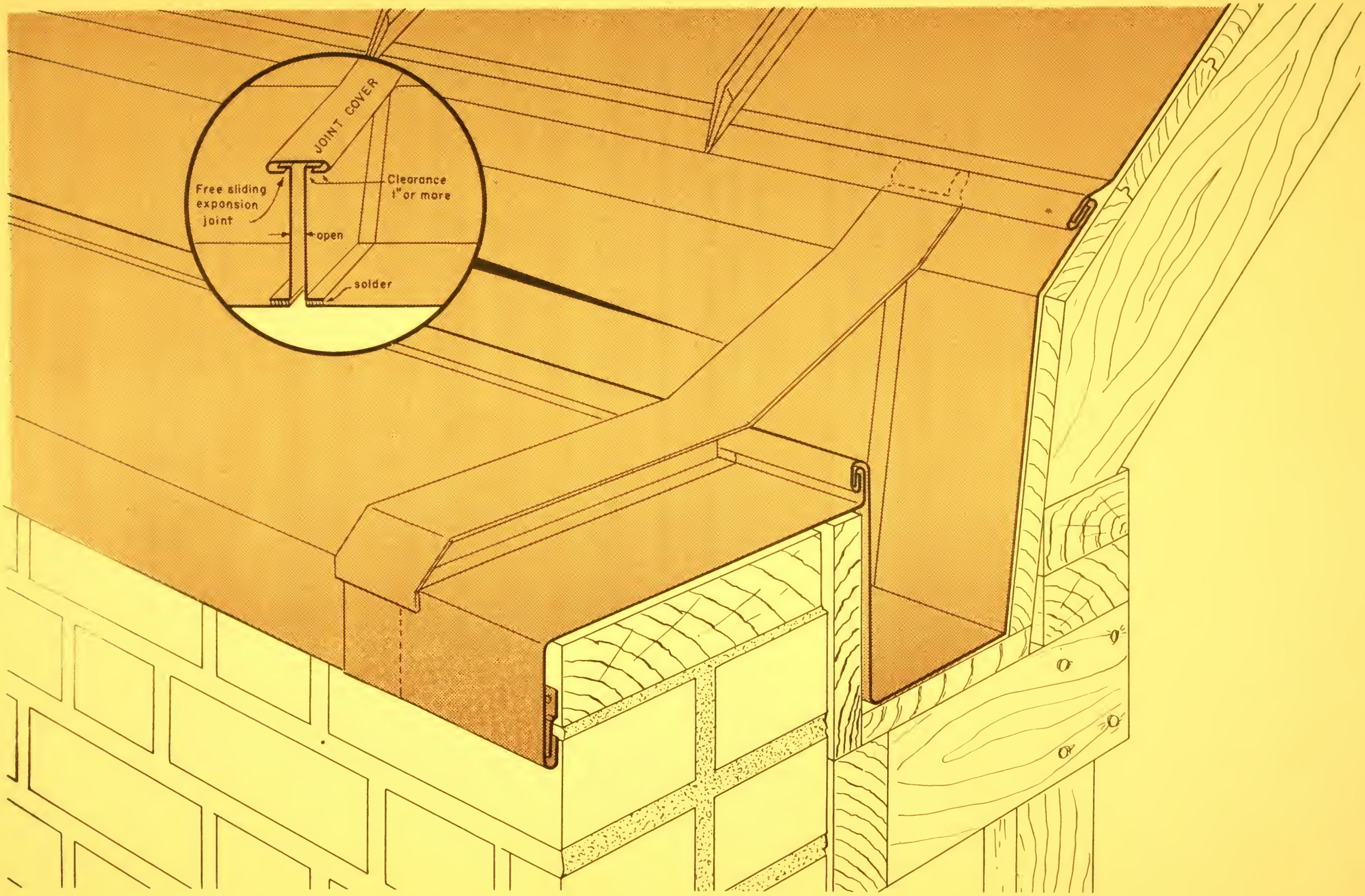

ANACONDA AMERICAN BRASS LIMITED—NEW TORONTO, ONT.

COPPER BUILT-IN GUTTER AND COPPER COPING

This style of gutter with copper coping and a hip roof is particularly suitable for houses of Regency design. It also conforms to the trend in design with modern architecture. It provides a well defined sky line of delicate detail, and has the advantage of an easily accessible gutter.

When a gutter is built into the roof, and located inside the outer wall, there is little likelihood of clogging or damming up with ice in cold climates. That condition usually occurs in uninsulated houses where in the coldest weather the heat escaping through the attic warms the roof boarding, with the result that the underside of the snow in contact with the roof melts and runs down the slope to the gutter where it saturates the snow in the gutter and freezes into a bar of ice. This is particularly so with gutters that are built into the roof outside of the wall line, and thereby exposed to the cold outdoor air at the top, front and bottom. In the case of this detail, the gutter is inside the outer wall, and there is much less chance for the water to freeze before it reaches the drain.

In observance of the new theory regarding soldered copper work, and for work of the size as shown on the drawing, both the gutter and coping should be made of 20 oz. cold rolled cornice temper copper. There should be expansion joints between all downspouts and free sliding edges at the longitudinal seams. Any cross seams except those at the expansion joints should be made with a clinch lock and blind soldered. It is very important that the metal at the joints be thoroughly cleaned, preferably with steel wool, then pretinned before being interlocked, fluxed and soldered.

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COPPER SHEET METAL WORK R.A.I.C.-A.I.A. FILE No. 12